United States
Department of
Agriculture

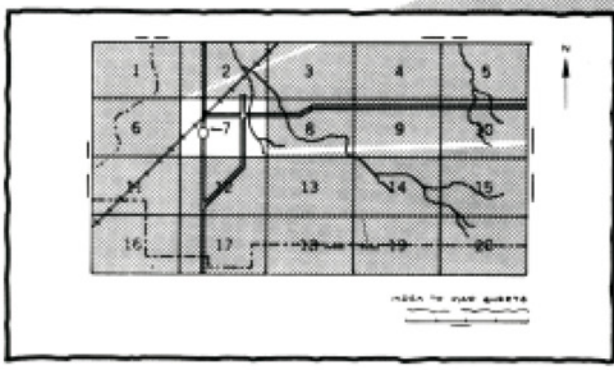
Soil
Conservation
Service

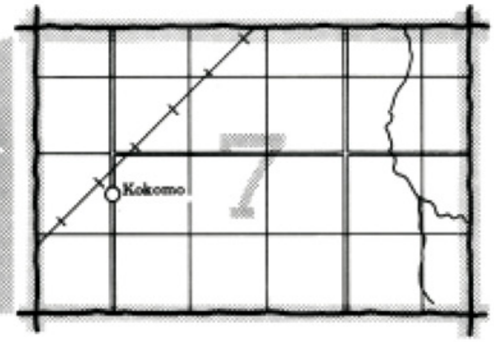
In cooperation with
United States Department of
Agriculture, Forest Service,
and South Dakota
Agricultural Experiment
Station

Soil Survey of Harding County, South Dakota

HOW TO USE

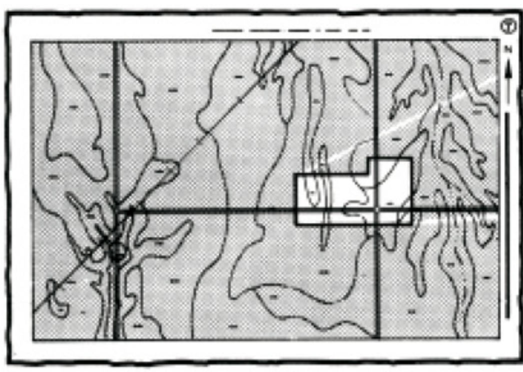
1. Locate your area of interest on the "Index to Map Sheets"

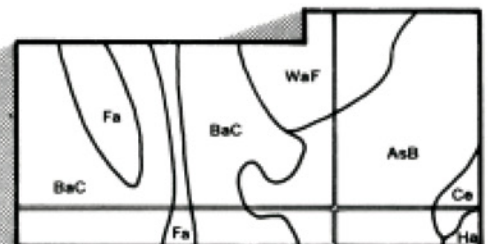




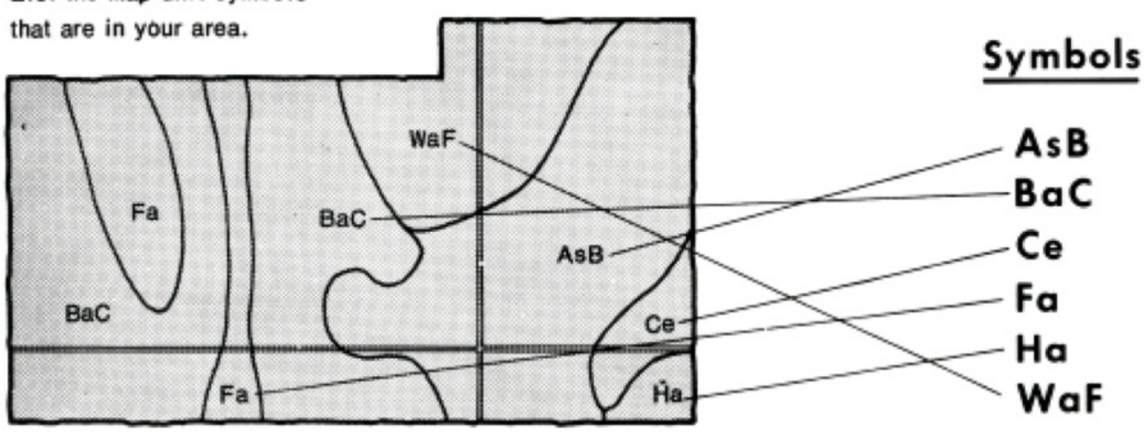
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



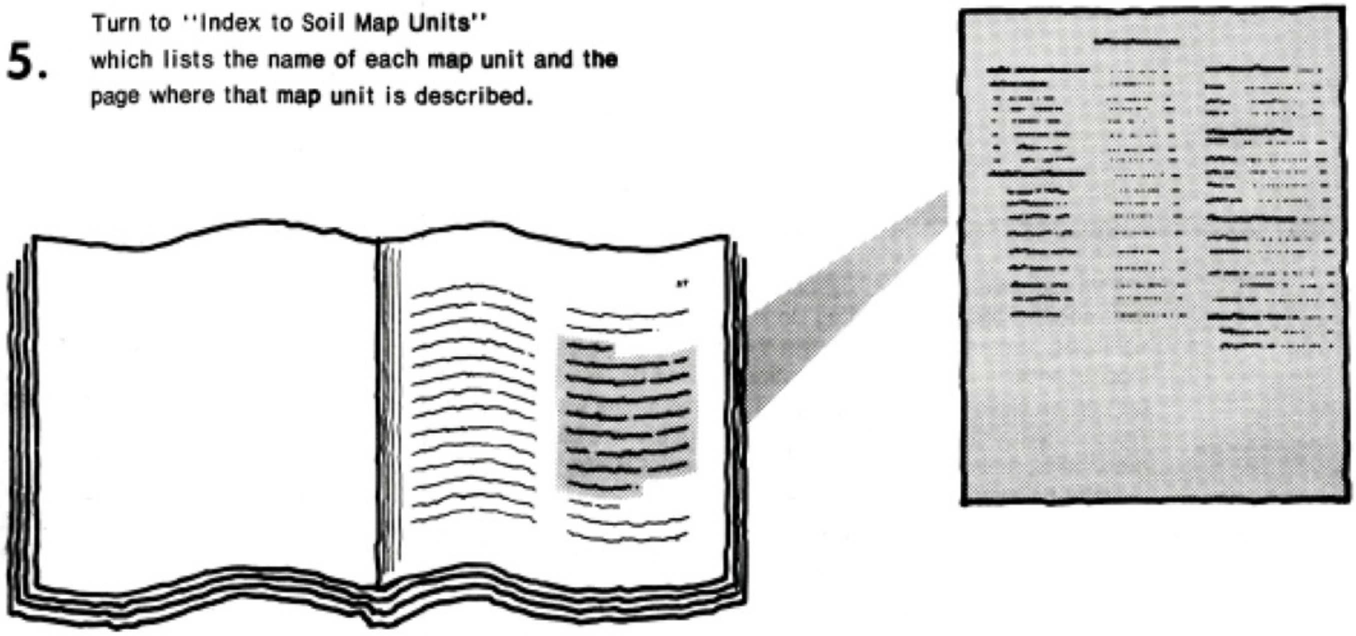


4. List the map unit symbols that are in your area.

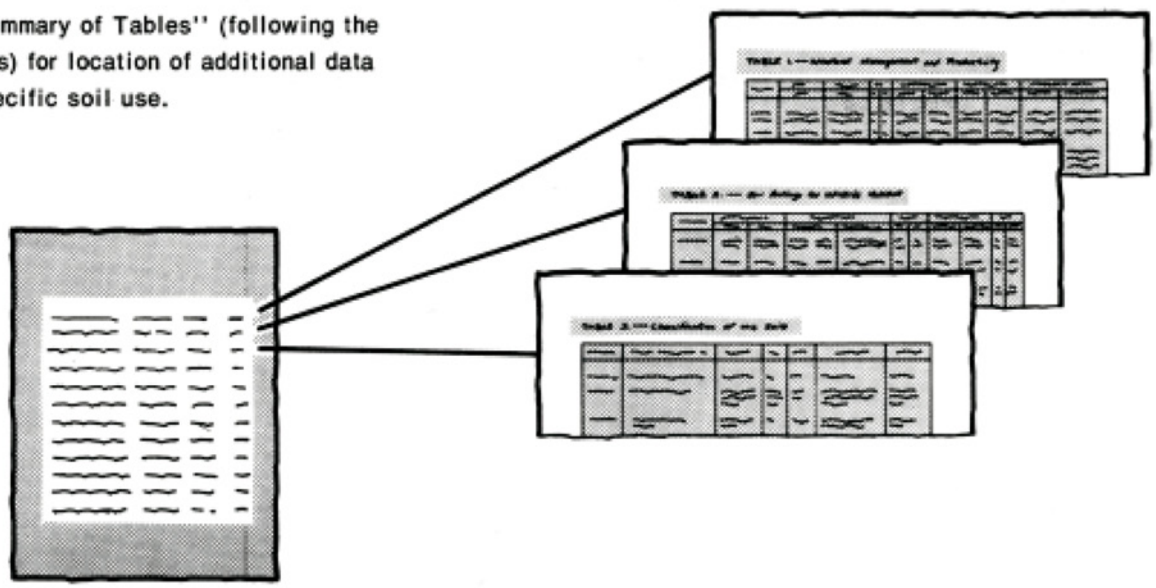


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, handicap, or age.

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1984. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Harding County Conservation District. Financial assistance was furnished by the Old West Regional Commission and the Forest Service.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: An area of Cabbart-Rock outcrop complex, 15 to 40 percent slopes, in the foreground. An area of Rock outcrop-Reva complex, 15 to 60 percent slopes, is on the escarpment in the background.

Contents

Soil Series

Issued December 1988

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Harding County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

C. Budd Fountain

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Soil Survey of
Harding County, South Dakota

By Warren F. Johnson, Soil Conservation Service

Soils surveyed by Warren F. Johnson, Arvid C. Meland, Glenn Dunavan, Calvin Hoenshell, Kenneth Miller, and C. Howard Weisner, Soil Conservation Service; Daniel Anderson, South Dakota State University; and Paul Wellman, South Dakota Division of Conservation

United States Department of Agriculture,
Soil Conservation Service and Forest Service,
in cooperation with
the South Dakota Agricultural Experiment Station

HARDING COUNTY is in the northwest corner of South Dakota (fig. 1). It has a total of 1,714,771 acres, or about 2,679 square miles. This acreage includes about 6,750 acres of water. About 29,880 acres is administered by the Bureau of Land Management and 73,529 acres by the Forest Service. The land administered by the Bureau of Land Management is intermingled with private and state-owned land. The land administered by the Forest Service is primarily within the boundaries of Custer National Forest.

Buffalo is the county seat and principal town in Harding County. Camp Crook is the only other organized town in the county. Other communities are Ludlow, Ralph, Redig, and Reva. Only a few buildings and foundations mark the former villages of Gustav, Harding, and Ladner.

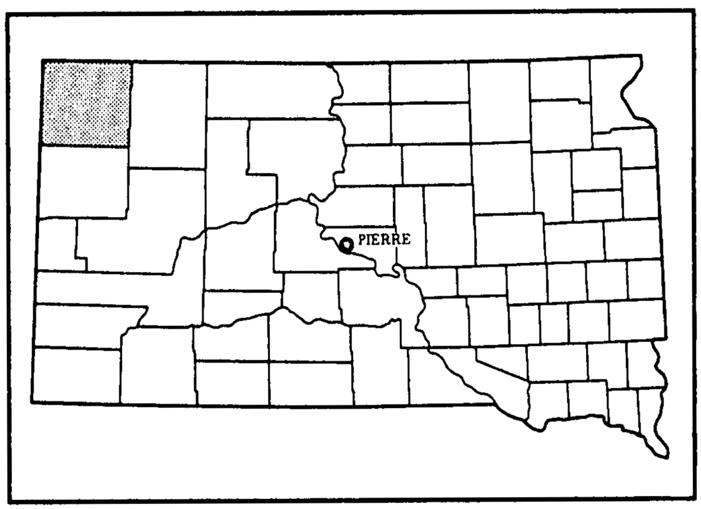

Figure 1.—Location of Harding County in South Dakota.

General Nature of the County

This section gives general information concerning the county. It describes climate; physiography, relief, and drainage; settlement; ranching and farming; and natural resources.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Harding County generally is quite warm in summer. Hot spells frequently occur, and cool days occasionally occur. The county is very cold in the winter, when artic air surges over the area. Most precipitation falls late in spring and early in summer. Snowfall is normally not too heavy, but it is blown into drifts, so that much of the ground is free of snow.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Redig in the period 1951 to 1980. Table 2 shows probable dates of the first

freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 19 degrees F, and the average daily minimum temperature is 8 degrees. The lowest temperature on record, which occurred at Redig on January 20, 1954, is -36 degrees. In summer the average temperature is 68 degrees, and the average daily maximum temperature is 82 degrees. The highest recorded temperature, which occurred at Redig on July 20, 1960, is 108 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 14.71 inches. Of this, 12 inches, or about 80 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 9 inches. The heaviest 1-day rainfall during the period of record was 3.46 inches at Redig on June 14, 1976. Thunderstorms occur on about 42 days each year, and most occur in summer. Hail falls in small scattered areas during some of these storms.

The average seasonal snowfall is about 40 inches. The greatest snow depth at any one time during the period of record was 38 inches. On the average, 47 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 70 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the north-northwest. Average windspeed is highest, 16 miles per hour, in spring.

Physiography, Relief, and Drainage

Most of Harding County is on the Cretaceous Table Lands, but the extreme southwest corner is in the Pierre Hills of the Great Plains physiographic province (*7*). The soils generally are nearly level to moderately steep, but those near drainageways and on the sides of flat-topped buttes are steep or very steep. On the Cretaceous Table Lands, several prominent buttes rise above the surrounding landscape. A few areas of "badlands" are along the Little Missouri River.

The western part of the county is drained by the Little Missouri River. The southern part is drained by the North Fork of the Moreau River. The central and north-central parts are drained by the South Fork of the Grand River and by the larger perennial streams, such as Bull Creek, Clarke Fork Creek, and Big Nasty Creek. The northeast corner of the county is drained by the North Fork of the Grand River. The rest of the streams carry a significant amount of water only in spring and after heavy rainfall.

Land elevation ranges from 2,680 feet above sea level in an area along the North Fork of the Moreau River in the southeast corner of the county to 4,015 feet on the East Short Pines.

Settlement

Harding County was named after J.A. Harding, a speaker of the Dakota Territorial House (*5*). It was established in 1881. The original county included the northern part of present-day Butte County and was eight townships wide. After several realignments, the present boundaries were established in February 1909.

Buffalo, in the center of the county, had a population of 453 in 1980, and Camp Crook, in the western part, had one of 100 (*12*). The remainder of the county is very sparsely settled.

U.S. Highway 85 and South Dakota State Highways 20 and 79 are the main thoroughfares. Many rural areas are served by poor roads and by trails. The county has no railroads or commercial airlines. All goods are transported by commercial trucks.

Ranching and Farming

Ranching is the principal enterprise in Harding County. Beef cattle and sheep are the main types of livestock. Most of the farm income is derived from the sale of livestock and livestock products. Wool production and the selling of lambs are the main sources of income from sheep enterprises. Many of the crops are used as feed for livestock. Most of the small grain is sold as a cash crop.

About 88 percent of the acreage is range, and about 12 percent is used for cultivated crops or for tame pasture and hay (*3*). Alfalfa and tame grasses are used for hay. Spring wheat, winter wheat, and oats are the main cultivated crops. A small acreage is used for grain sorghum and barley.

The Harding County Conservation District was organized in 1949. It has been instrumental in planting grasses and trees to help control erosion. The trees also provide protection for farmsteads and habitat for wildlife.

Natural Resources

Soil is the most important natural resource in Harding County. It provides a growing medium for the grasses grazed by livestock and for crops. Other important natural resources are oil, water, timber, sand and gravel, and wildlife.

The principal sources of water for livestock are impoundments of surface runoff and shallow wells. A few

artesian wells that extend into the Dakota Formation provide additional water, but the quality is poor (*4*). The Little Missouri River is a source of water for livestock, irrigation, and wildlife. Shallow wells on flood plains and terraces provide a limited supply of water.

Oil is a source of income in the north-central part of the county. The wells are marginal for economic development, however, because production is low.

The timbered areas dominantly support ponderosa pine. They are in the North and South Cave Hills, in the East and West Short Pines, and on the Slim Buttes.

Antelope, deer, and grouse are the main wildlife resources in the county. Coyotes and red fox are the chief predators.

The deposits of sand and gravel in the county are mainly on scattered terrace scarps. These deposits range from a few inches to many feet in thickness. Because of an excess amount of fine rock fragments, such as shale, chalk, and clay ironstone, most of the sand and gravel is unsuitable as construction material and concrete aggregate. It is suitable, however, as subgrade material for roads and as bituminous aggregate. Porcellanite is used for gravel in the northern part of the county. This material breaks down into a red, very dusty clay after several years.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit.

Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The 16 associations on the general soil map of the county have been grouped for broad interpretive purposes. The associations and the groups are described on the pages that follow. The names of the associations do not coincide exactly with those on the general soil maps in the published surveys of Butte and Perkins Counties, which are adjacent to this county. Differences are the result of variations in the design and composition of the associations or changes and refinements in series concepts.

Soil Descriptions

Nearly Level to Very Steep, Clayey Soils on Uplands, Terraces, and Foot Slopes

These soils dominantly are nearly level to strongly sloping but range to very steep in places. They make up about 3 percent of the county. Nearly all of the acreage is range. Controlling water erosion is the main management concern.

1. Swanboy Association

Deep, well drained, nearly level to moderately sloping, clayey soils on foot slopes and terraces

This association is on foot slopes and terraces in the southwestern part of the county. The landscape is characterized by long, smooth slopes. The slopes generally are nearly level to gently sloping but are moderately sloping in places. The drainage pattern is poorly defined, but narrow, meandering stream channels are in some areas.

This association makes up about 1 percent of the county. It is about 55 percent Swanboy soils and 45 percent minor soils.

The Swanboy soils have a slope of 0 to 9 percent. Typically, the surface layer is olive gray, calcareous clay. The subsoil is light olive gray, calcareous clay. It has nests of gypsum crystals and other salts in the lower part. The underlying material is pale olive and olive, calcareous clay. It has many nests of gypsum crystals and other salts throughout.

Minor in this association are the Hisle, Kyle, and Twotop soils and Slickspots. The sodium affected Hisle soils are in small depressions. Kyle and Twotop soils are deeper to visible salts than the Swanboy soils. They are near the edges of the association. Slickspots are in scattered areas throughout the association. They have a puddled or slick surface. They generally do not support vegetation.

Nearly all of this association is range. Controlling water erosion and preventing surface compaction are the main management concerns. The association is suited to range and to rangeland wildlife habitat. It generally is unsuited to cultivated crops and to tame pasture and hay because of extremely poor tilth.

2. Lismas-Winler Association

Shallow and moderately deep, well drained, gently sloping to very steep, clayey soils on uplands

This association is on uplands in the southwestern part of the county. The landscape is characterized by steep slopes and by deeply entrenched drainageways. The soils generally are moderately sloping to very steep but are gently sloping in some areas. The drainage pattern is well defined.

This association makes up about 2 percent of the county. It is about 40 percent Lismas soils, 35 percent Winler soils, and 25 percent minor soils (fig. 2).

The shallow Lismas soils are on ridges and the upper side slopes. Slopes range from 3 to 60 percent. Typically, the surface layer is olive gray clay. The underlying material is olive gray clay. It has many nests of gypsum crystals throughout. Olive shale is at a depth of about 15 inches.

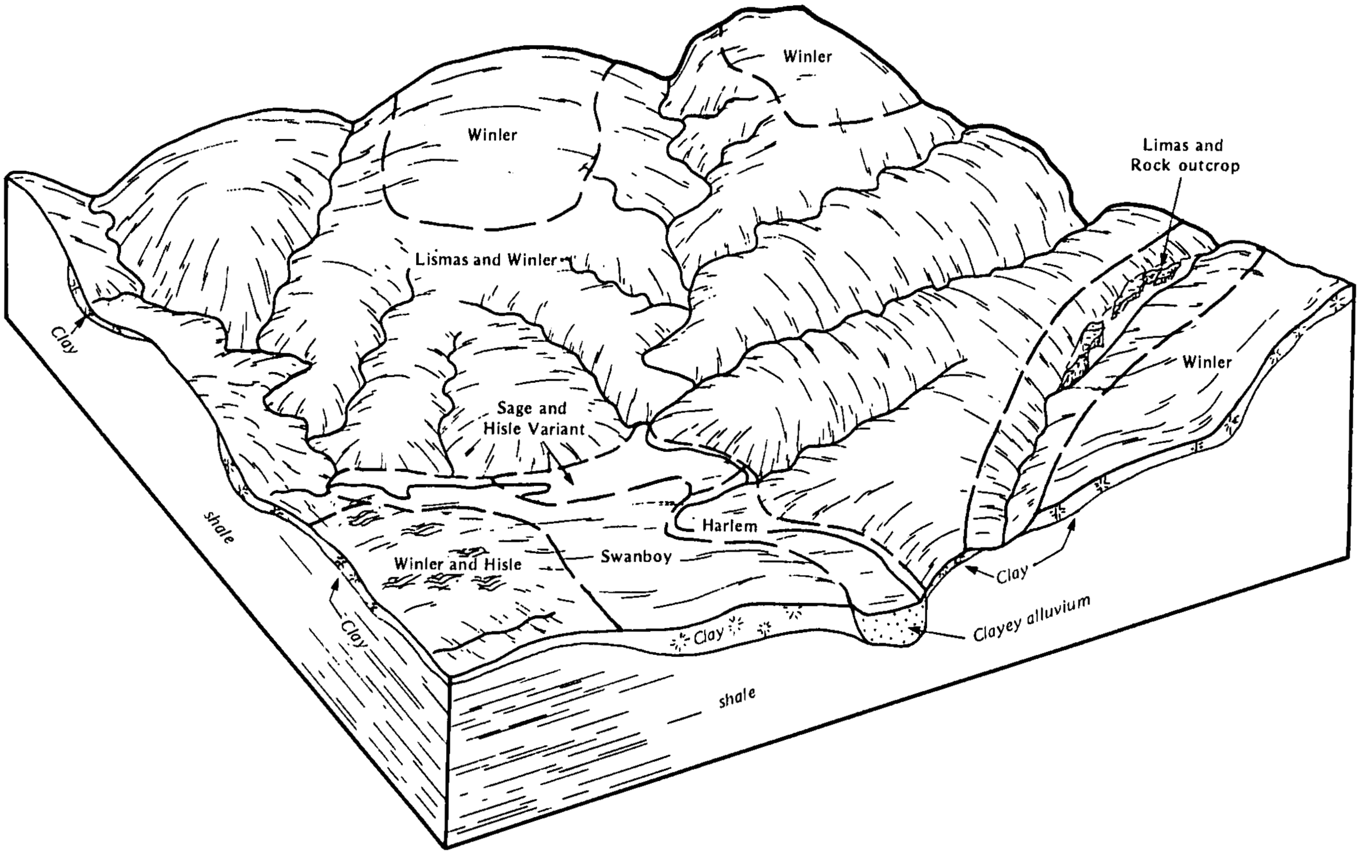

Figure 2.—Pattern of soils and parent material in the Lismas-Winler association.

The moderately deep Winler soils are on side slopes. Slopes range from 2 to 15 percent. Typically, the surface layer is grayish brown clay. The subsoil is grayish brown and light brownish gray clay. It has nests of gypsum crystals in the lower part. The underlying material is light brownish gray clay. It has nests of gypsum crystals and fragments of shale throughout. Clayey shale is at a depth of about 25 inches.

Minor in this association are the Harlem, Hisle, Hisle Variant, Sage, Swanboy, and Twotop soils and areas of Rock outcrop and Slickspots. The stratified Harlem soils and the poorly drained Hisle Variant soils are on narrow flood plains. The sodium affected Hisle soils and the deep Swanboy and Twotop soils are on foot slopes. The poorly drained Sage soils are along narrow drainageways. Rock outcrop is intermingled throughout areas of the Lismas soils. It occurs as exposures of unweathered shale. Slickspots are intermingled throughout areas of the Hisle soils. They have a puddled or slick surface. They generally do not support vegetation.

Nearly all of this association is range. Controlling water erosion is the main management concern. The association is suited to range and to rangeland wildlife habitat. It generally is unsuited to cultivated crops and to tame pasture and hay because of the slope and shallow depth to shale in areas of the Lismas soils and extremely poor tilth in the Winler soils.

Nearly Level, Sandy and Loamy Soils on Flood Plains

These soils dominantly are nearly level. They make up about 4 percent of the county. About 70 percent of the acreage is range. Conserving moisture, improving fertility, and controlling wind erosion are the main management concerns.

3. Hanly-Korchea-Glendive Association

Deep, somewhat excessively drained and well drained, nearly level, sandy and loamy soils on flood plains

This association makes up about 4 percent of the county. It is about 35 percent Hanly soils, 30 percent Korchea soils, 15 percent Glendive soils, and 20 percent minor soils (fig. 3).

The somewhat excessively drained Hanly soils have a slope of 0 to 3 percent. Typically, the surface layer is

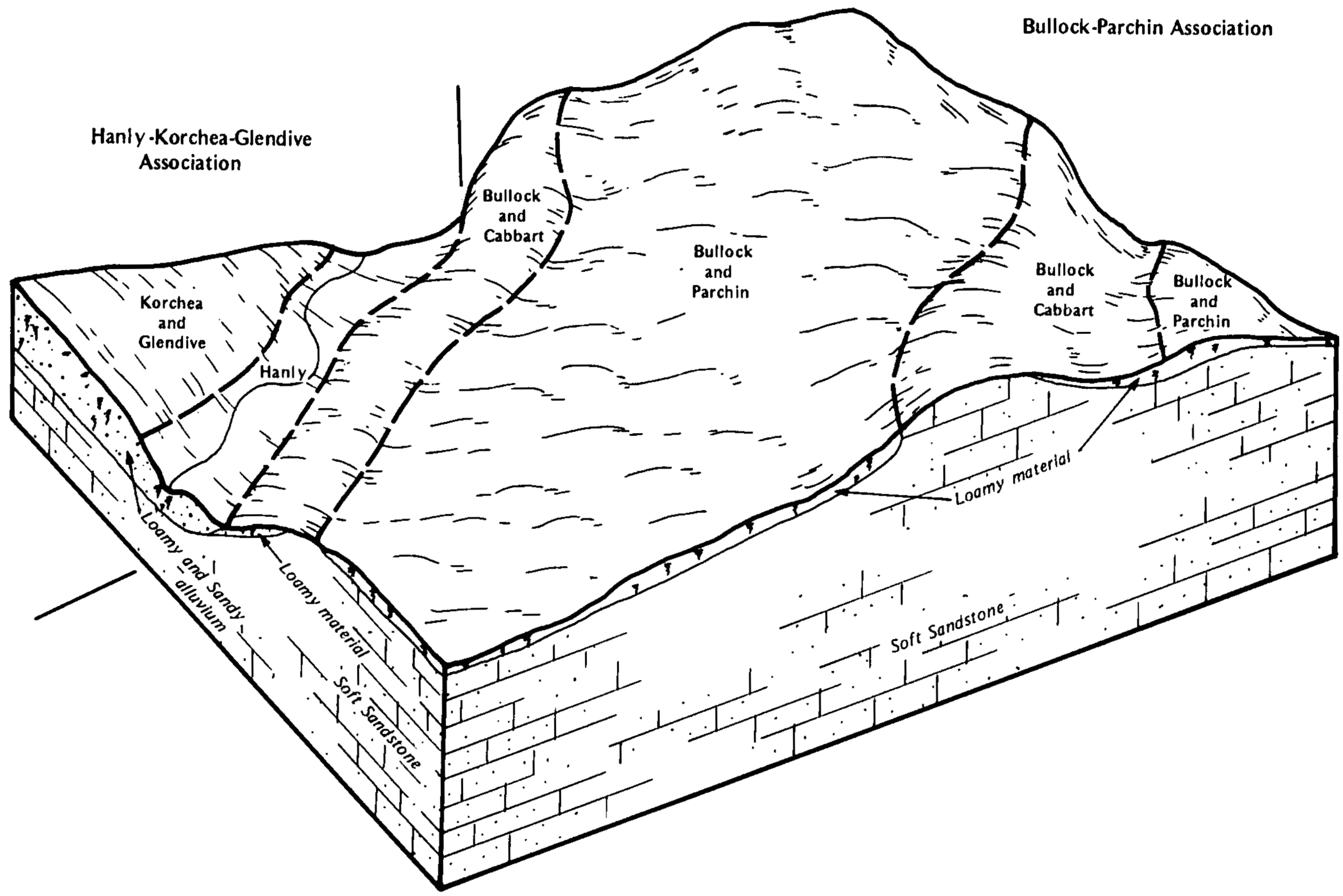

Figure 3.—Pattern of soils and parent material in the Hanly-Korchea-Glendive and Bullock-Parchin associations.

grayish brown, calcareous loamy fine sand. The underlying material is light brownish gray and light olive gray, stratified, calcareous sand and loamy fine sand.

The well drained Korchea soils have a slope of 0 to 2 percent. Typically, the surface layer is dark grayish brown, stratified loam and silt loam. It is calcareous in the lower part. The underlying material is grayish brown and light brownish gray, stratified, calcareous loam, fine sandy loam, and clay loam.

The well drained Glendive soils have a slope of 0 to 2 percent. Typically, the surface layer is grayish brown fine sandy loam. The underlying material is light brownish gray, olive, and pale olive, stratified, calcareous fine sandy loam, loam, and loamy sand.

Minor in this association are the Archin, Dogiecreek, Havre, and Sage soils and Slickspots. The sodium affected Archin soils and the saline Dogiecreek and Sage soils are on the low parts of the flood plains. The loamy, light colored Havre soils are in positions on the landscape similar to those of the Glendive soils. Slickspots are intermingled throughout areas of the Glendive soils. They have a puddled or slick surface. They generally do not support vegetation.

About 70 percent of this association is range. Controlling wind erosion and improving fertility are the main management concerns. The association is suited to range and to rangeland wildlife habitat. Most of the cropland is along the Little Missouri River. Alfalfa and small grain are the main crops. The Glendive and Korchea soils are suited to cultivated crops and to tame pasture and hay. The Hanly soils generally are unsuited to cultivated crops because of a severe hazard of wind erosion and a low available water capacity. In some areas deciduous trees and shrubs provide protection for livestock and wildlife.

Nearly Level to Gently Sloping, Loamy Soils on Terraces, Fans, and Uplands

These soils dominantly are nearly level but are very gently sloping in some places and gently sloping in others. They make up about 6 percent of the county.

About 76 percent of the acreage is range. Controlling wind erosion and improving tilth are the main management concerns.

4. Chinook-Archin-Assinniboine Association

Deep, well drained, nearly level to gently sloping, loamy soils on terraces, fans, and uplands

This association is on terraces, fans, and uplands in the west-central part of the county. Slopes mainly are nearly level, but some areas are gently sloping. The drainage pattern is fairly well defined.

This association makes up about 4 percent of the county. It is about 35 percent Chinook soils, 20 percent Archin soils, 20 percent Assinniboine soils, and 25 percent minor soils.

The Chinook soils are on low knolls on fans and terraces. Slopes range from 0 to 3 percent. Typically, the surface layer is grayish brown fine sandy loam. The subsoil is brown and light brownish gray fine sandy loam. It is calcareous in the lower part. The underlying material is light olive gray and light gray, calcareous fine sandy loam.

The sodium affected Archin soils are on fans and terraces. Slopes range from 0 to 6 percent. Typically, the surface layer is grayish brown fine sandy loam. The next layer is light brownish gray loam. The subsoil is grayish brown and light brownish gray loam. In the lower part it is calcareous and has gypsum crystals and other salts. The underlying material is light brownish gray, calcareous loam. It has gypsum crystals and other salts throughout.

The Assinniboine soils are in nearly level areas and on low knolls on terraces and uplands. Slopes range from 0 to 6 percent. Typically, the surface layer is grayish brown fine sandy loam. The subsoil is brown loam and sandy clay loam in the upper part and grayish brown, calcareous fine sandy loam in the lower part. The underlying material is grayish brown, calcareous loamy sand.

Minor in this association are the Bullock and Attewan soils and Slickspots. The sodium affected Bullock soils have a surface layer that is thinner than that of the Archin soils. They are in small pits and depressions. Attewan soils are underlain by gravelly material. They are on terraces. Slickspots have a puddled or slick surface. They are intermingled throughout areas of the Archin soils. They generally do not support vegetation.

About 85 percent of this association is range. Some areas are used as cropland. Alfalfa, winter wheat, spring wheat, and oats are the main crops. Controlling wind erosion and conserving moisture are the main management concerns in the cultivated areas. The association is suited to cultivated crops and to tame pasture and hay, range, and both openland and rangeland wildlife habitat.

5. Archin-Kremlin-Bullock Association

Deep, well drained, nearly level and very gently sloping, loamy soils on terraces, fans, and uplands

This association is on high terraces and on fans and uplands. It is characterized by gentle rises and by smooth areas with small depressions. Slopes mainly are nearly level and very gently sloping but are steeper along drainageways. In most areas the drainage pattern is well defined, but it is poorly defined in some nearly level areas.

This association makes up about 2 percent of the county. It is about 35 percent Archin soils, 20 percent Kremlin soils, 20 percent Bullock soils, and 25 percent minor soils.

The sodium affected Archin soils are on terraces and fans. Slopes range from 0 to 4 percent. Typically, the surface layer is grayish brown fine sandy loam. The next layer is light brownish gray loam. The subsoil is grayish brown and light brownish gray loam. In the lower part it is calcareous and has gypsum crystals and other salts. The underlying material is light brownish gray, calcareous loam. It has gypsum crystals and other salts throughout.

The Kremlin soils are on slight rises on terraces and fans. Slopes range from 0 to 3 percent. Typically, the surface layer is grayish brown loam. The subsoil is dark grayish brown, light yellowish brown, and light brownish gray loam. It is calcareous in the lower part. The underlying material is light olive gray, stratified, calcareous loam.

The sodium affected Bullock soils generally are in small pits and depressions on terraces and uplands. Slopes range from 0 to 4 percent. Typically, the surface layer is grayish brown and light brownish gray fine sandy loam. The subsoil is grayish brown sandy clay loam in the upper part and light brownish gray and light gray, calcareous sandy clay loam, loam, and clay loam in the lower part. It has gypsum crystals and other salts in the lower part. The underlying material is light olive gray, calcareous fine sandy loam. It has gypsum crystals and other salts throughout.

Minor in this association are the Assinniboine, Attewan, and Eapa soils and Slickspots. Assinniboine and Eapa soils are intermingled with areas of the Kremlin soils. They have more clay in the subsoil than the Kremlin soils. Attewan soils are on terraces. They are 20 to 40 inches deep to gravelly material. Slickspots are in small pits and depressions. They have a puddled or slick surface. They do not support vegetation.

About 60 percent of this association is range. Some areas are cultivated. Alfalfa, spring wheat, and winter wheat are the main crops. Controlling wind erosion, improving tilth, and conserving moisture are the main management concerns. The association is suited to range and rangeland wildlife habitat. The Archin and Kremlin soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the

Archin soils is a limitation. The Bullock soils are unsuited to cultivated crops because of the sodium affected subsoil near the surface.

Nearly Level to Very Steep, Loamy and Sandy Soils on Uplands

These soils dominantly are nearly level to moderately steep but are undulating to hilly in places and are very steep along some drainageways. They make up about 44 percent of the county. About 90 percent of the acreage is range. Controlling erosion, improving tilth, and conserving moisture are the main management concerns.

6. Zeona-Trey Association

Deep and moderately deep, excessively drained and well drained, undulating to hilly, sandy soils on uplands

This association is on uplands characterized by a hummocky topography. In most areas the drainage pattern is poorly defined.

This association makes up about 6 percent of the county. It is about 40 percent Zeona soils, 25 percent Trey soils, and 35 percent minor soils.

The deep, excessively drained Zeona soils have a slope of 2 to 25 percent. Typically, the surface layer is dark grayish brown loamy fine sand. The underlying material is grayish brown fine sand and loamy fine sand.

The moderately deep, well drained Trey soils generally are on ridges. Slopes range from 2 to 25 percent. Typically, the surface layer is dark grayish brown loamy fine sand. The next layer is grayish brown fine sand. Soft sandstone is at a depth of about 30 inches.

Minor in this association are the Bullock, Fleak, Parchin, and Twilight soils and Rock outcrop. The sodium affected Bullock and Parchin soils are in small pits and depressions on the low parts of the landscape. The shallow Fleak soils are on ridges. Rock outcrop is intermingled throughout areas of the Trey soils. The moderately deep, loamy Twilight soils are on the less sloping parts of the landscape.

Nearly all of this association is range. Controlling wind erosion is the main management concern. The association is suited to range and to rangeland wildlife habitat. It generally is unsuited to cultivated crops and to tame pasture and hay because of a low available water capacity and an extremely severe hazard of wind erosion.

7. Bullock-Parchin Association

Moderately deep, well drained, nearly level to gently sloping, loamy soils on uplands

This association is on uplands characterized by low rises and by shallow pits and depressions. Slopes generally are nearly level to gently sloping but are steeper along some drainageways. In most areas the drainage pattern is well defined.

This association makes up about 18 percent of the county. It is about 35 percent Bullock soils, 20 percent Parchin soils, and 45 percent minor soils (fig. 3).

The Bullock soils are in small pits and shallow depressions. Slopes range from 0 to 6 percent. Typically, the surface layer is grayish brown and light brownish gray fine sandy loam. The subsoil is grayish brown sandy clay loam in the upper part and light brownish gray and light gray, calcareous sandy clay loam, loam, and clay loam in the lower part. Gypsum and other salts are in the lower part. Light gray, soft sandstone is at a depth of about 29 inches.

The Parchin soils are on slight rises. Slopes range from 2 to 6 percent. Typically, the surface layer is grayish brown fine sandy loam. The subsurface layer is light brownish gray fine sandy loam. The subsoil is brown, grayish brown, and light brownish gray sandy clay loam and clay loam. In the lower part it is calcareous and has gypsum and other salts. The underlying material is light gray, calcareous sandy clay loam. It has gypsum and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches.

Minor in this association are the Cabbart, Marmarth, Rhame, and Twilight soils and Slickspots. The shallow Cabbart soils are on the crest of narrow ridges. The moderately deep Marmarth, Rhame, and Twilight soils are on the smoother parts of the side slopes. They do not have a sodium affected subsoil. Slickspots are in small pits and depressions. They have a puddled or slick surface. They do not support vegetation.

Nearly all of this association is range. A small acreage of the Parchin soils and of the minor soils is cultivated. Controlling wind erosion, preventing compaction, and conserving moisture are the main management concerns. The association is suited to range and to rangeland wildlife habitat. The Bullock soils generally are unsuited to cultivated crops because of the sodium affected subsoil near the surface.

8. Twilight-Parchin-Cabbart Association

Moderately deep and shallow, well drained, gently sloping to very steep, loamy soils on uplands

This association is on uplands characterized by smooth, gently sloping areas and by more sloping areas that are deeply dissected. In most areas the drainage pattern is well defined.

This association makes up about 16 percent of the county. It is about 40 percent Twilight soils, 20 percent Parchin soils, 20 percent Cabbart soils, and 20 percent minor soils.

The moderately deep Twilight soils are on side slopes. Slopes range from 6 to 25 percent. Typically, the surface layer is grayish brown fine sandy loam. The subsoil is brown and yellowish brown fine sandy loam and sandy loam. The underlying material is light olive brown sandy loam. Soft sandstone is at a depth of about 30 inches.

The moderately deep, sodium affected Parchin soils are in small depressions on low side slopes. Slopes range from 2 to 15 percent. Typically, the surface layer is grayish brown fine sandy loam. The subsurface layer is light brownish gray fine sandy loam. The subsoil is brown, grayish brown, and light brownish gray sandy clay loam and clay loam. In the lower part it is calcareous and has gypsum and other salts. The underlying material is light gray, calcareous sandy clay loam. It has gypsum and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches.

The shallow Cabbart soils are on the upper side slopes and on ridges. Slopes range from 6 to 60 percent. Typically, the surface layer is light yellowish brown, calcareous loam. The subsoil is pale yellow, calcareous loam. Weakly consolidated bedrock is at a depth of about 11 inches.

Minor in this association are the Bullock, Chinook, and Marmarth soils. The sodium affected Bullock soils are in small pits and depressions. They have a surface layer that is thinner than that of the Parchin soils. The deep Chinook soils are on foot slopes. Marmarth soils are in positions on the landscape similar to those of the Twilight soils. They have more clay in the subsoil than the Twilight soils.

Nearly all of this association is range. A small acreage of the Twilight and Parchin soils is cultivated. Controlling wind erosion is the main management concern. The association is suited to range and to rangeland wildlife habitat. The Twilight and Parchin soils are suited to cultivated crops and to tame pasture and hay. The Cabbart soils generally are not suited to cultivated crops because they are shallow over bedrock.

9. Reeder-Rhoades Association

Moderately deep, well drained, nearly level to strongly sloping, loamy soils on uplands

This association is on uplands characterized by gently sloping areas and by smooth areas with small depressions. Slopes mainly are nearly level to gently sloping but are steeper along drainageways. In most areas the drainage pattern is well defined, but it is poorly defined in some nearly level areas.

This association makes up about 4 percent of the county. It is about 45 percent Reeder soils, 25 percent Rhoades soils, and 30 percent minor soils.

Reeder soils are on slight rises and the upper side slopes. Slopes range from 0 to 15 percent. Typically, the surface layer is grayish brown loam. The subsoil is grayish brown, light brownish gray, and light gray loam and clay loam. Light gray, soft sandstone is at a depth of about 30 inches.

The sodium affected Rhoades soils are in small pits on low side slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is grayish brown loam. The subsoil is grayish brown silty clay loam and silty clay. In the lower part it is calcareous and has gypsum and other salts. Soft sandstone is at a depth of about 32 inches.

Minor in this association are the Amor, Cabba, Daglum, Grail, and Korchea soils and Slickspots. Amor soils are in positions on the landscape similar to those of the Reeder soils. They have less clay in the subsoil than the Reeder soils. The shallow Cabba soils are on ridges. Daglum soils are on small flats and in depressions. They have a surface layer that is thicker than that of the Rhoades soils. Grail soils are in swales. They are dark to a depth of more than 16 inches. The stratified Korchea soils are on narrow flood plains. Slickspots are in small pits in areas of the Rhoades soils. They have a puddled or slick surface. They generally do not support vegetation.

About 80 percent of this association is range. Some areas of the Reeder soils are cultivated. Alfalfa, small grain, and tame grasses are the main crops. Controlling water erosion and conserving moisture are the main management concerns. The association is suited to range and to rangeland wildlife habitat. The Reeder soils are suited to cultivated crops and to tame pasture and hay. The Rhoades soils generally are unsuited to cultivated crops because of the sodium affected subsoil.

Rock Outcrop and Nearly Level to Very Steep, Loamy and Gravelly Soils on Uplands

These soils dominantly are gently sloping to steep but are nearly level in some areas and very steep along some drainageways and on the sides of some buttes. They make up about 26 percent of the county. About 98 percent of the acreage is range. The major soils generally are unsuitable for cultivation. Controlling erosion is the main management concern.

10. Cabba-Amor-Rhoades Association

Shallow and moderately deep, well drained, nearly level to moderately steep, loamy soils on uplands

This association is on uplands characterized by ridges and by narrow valleys. The soils generally are gently sloping to moderately steep but are nearly level in some areas and are very steep on some side slopes. The drainage pattern is well defined in most areas.

This association makes up about 8 percent of the county. It is about 35 percent Cabba soils, 25 percent Amor soils, 20 percent Rhoades soils, and 20 percent minor soils.

The shallow Cabba soils are on ridges and the upper side slopes. Slopes range from 6 to 25 percent. Typically, the surface layer is light brownish gray, calcareous loam. The subsoil is light brownish gray and light yellowish brown, calcareous loam. The underlying material is light yellowish brown, calcareous loam. Soft sandstone is at a depth of about 15 inches.

The moderately deep Amor soils are on side slopes. Slopes range from 0 to 15 percent. Typically, the surface

layer is grayish brown loam. The subsoil is light olive brown, grayish brown, and light brownish gray loam. It is calcareous in the lower part. Light gray, calcareous, soft sandstone is at a depth of about 34 inches.

The moderately deep, sodium affected Rhoades soils are in small pits on low side slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is grayish brown loam. The subsoil is grayish brown silty clay loam and silty clay. In the lower part it is calcareous and has gypsum and other salts. Soft sandstone is at a depth of about 32 inches.

Minor in this association are the Arnegard, Daglum, Grail, and Korchea soils and Slickspots. The deep Arnegard and Grail soils are in swales. They are dark to a depth of more than 16 inches. Daglum soils are on slight rises throughout areas of the Rhoades soils. The stratified Korchea soils are on narrow flood plains. Slickspots are in small pits and depressions throughout areas of the Rhoades soils. They have a puddled or slick surface. They generally do not support vegetation.

About 80 percent of this association is range. Some of the less sloping areas of the Amor soils are cultivated. Alfalfa, small grain, and tame grasses are the main crops. Controlling water erosion and conserving moisture are the main management concerns. The association is suited to range and to rangeland wildlife habitat. The Amor soils are suited to cultivated crops and to tame pasture and hay. The Cabba soils generally are unsuited to cultivated crops because they are shallow over bedrock. The sodium affected subsoil near the surface of the Rhoades soils restricts the penetration of plant roots.

11. Cabbart-Rock Outcrop-Delridge Association

Rock outcrop and shallow and moderately deep, well drained, moderately sloping to very steep, loamy soils on uplands

This association is on uplands generally characterized by moderately steep areas and by steeper slopes that are deeply dissected and are below areas where bedrock crops out. In most areas the drainage pattern is well defined.

This association makes up about 10 percent of the county. It is about 40 percent Cabbart soils, 20 percent Rock outcrop, 15 percent Delridge soils, and 25 percent minor soils (fig. 4).

The shallow Cabbart soils are on side slopes. Slopes range from 6 to 60 percent. Typically, the surface layer is light yellowish brown, calcareous loam. The subsoil is pale yellow, calcareous loam. Weakly consolidated bedrock is at a depth of about 11 inches.

The Rock outcrop is in areas of rimrock and on the sides of deeply dissected drainageways. It occurs as layers of sandstone, siltstone, and clayey shale and thin bands of lignite.

The moderately deep Delridge soils are on low side slopes. Slopes range from 6 to 40 percent. Typically, the surface layer is brown loam. The subsoil is light gray, calcareous loam. The underlying material is light brownish gray and light gray, calcareous loam. Weakly consolidated bedrock is at a depth of about 25 inches.

Minor in this association are the Bullock, Glendive, Korchea, Marmarth, Parchin, Rhame, and Twilight soils. The sodium affected Bullock and Parchin soils are in small pits and depressions on low side slopes. Glendive and Korchea soils are along narrow drainageways. The moderately deep Marmarth, Rhame, and Twilight soils are on the higher, less sloping parts of the landscape.

Nearly all of the acreage is range. Controlling water erosion is the main management concern. This association is suited to range and to rangeland wildlife habitat. It generally is unsuited to cultivated crops and to tame pasture and hay because of the slope of the Cabbart and Delridge soils, the shallow depth to bedrock in the Cabbart soils, and the Rock outcrop.

12. Reva-Rockoa Association

Shallow and deep, well drained, moderately sloping to very steep, gravelly and loamy soils on uplands

This association is on uplands characterized by moderately sloping areas and by deeply dissected drainageways. It is in areas known as the Slim Buttes and the East and West Short Pines. These areas support a sparse or moderate stand of evergreen trees and shrubs. The drainage pattern is well defined.

This association makes up about 6 percent of the county. It is about 35 percent Reva soils, 20 percent Rockoa soils, and 45 percent minor soils.

The shallow Reva soils are on the upper side slopes. Slopes range from 6 to 70 percent. Typically, the surface layer is light brownish gray, calcareous gravelly very fine sandy loam. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. White, hard sandstone is at a depth of about 16 inches.

The deep Rockoa soils are on low side slopes on pine-covered hills and along narrow drainageways. Slopes range from 6 to 60 percent. Typically, the surface is covered with partially decomposed forest litter. The surface layer is black loam. The subsurface layer is light gray loam. The next layer is grayish brown very channery loam. The subsoil is light gray and light brownish gray very channery loam and very channery clay loam. The underlying material is white, calcareous very channery loam.

Minor in this association are the Cabba, Slimbutte, Watrous, and Werner soils and Rock outcrop. The shallow, loamy Cabba soils are on ridges below the Reva soils. The deep Slimbutte soils are on low side slopes. The dark, moderately deep Watrous soils and the shallow Werner soils are in gently sloping and moderately sloping areas of prairie above the Reva and Rockoa soils. The Rock outcrop occurs as layers of hard sandstone, soft sandstone, siltstone, and clayey shale.

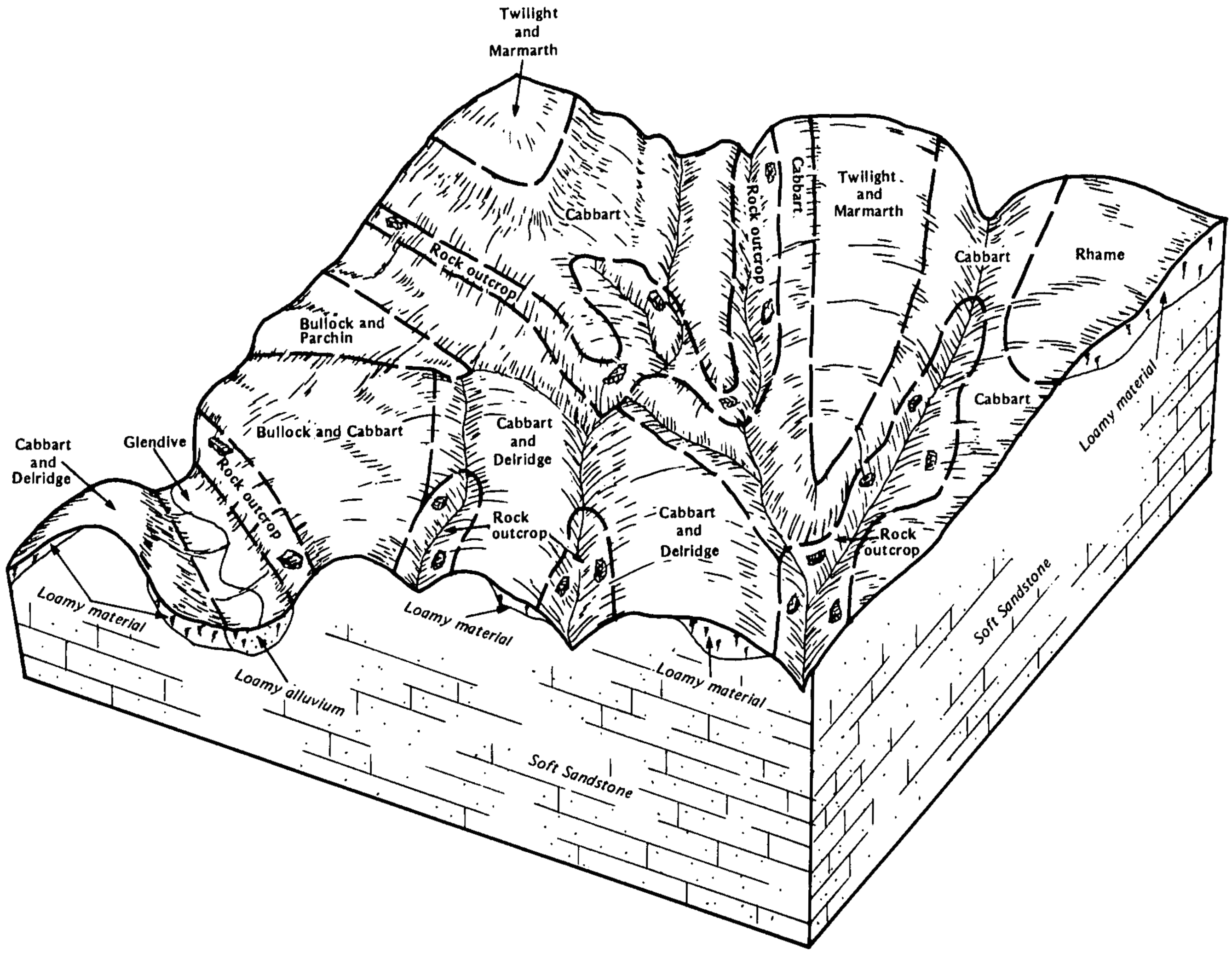

Figure 4.—Pattern of soils and parent material in the Cabbart-Rock outcrop-Delridge association.

They are in areas of rimrock and on the sides of deeply dissected drainageways.

Nearly all of this association is range. Some areas are used for timber. Controlling water erosion is the main management concern. The Reva soils are suited to range and to rangeland wildlife habitat. The Rockoa soils support a moderate stand of ponderosa pine. They are suited to timber and to woodland wildlife habitat. The association generally is unsuited to cultivated crops and to tame pasture or hay because of the shallow depth of the Reva soils and the slope of both the major soils.

13. Cohagen-Rock Outcrop Association

Rock outcrop and shallow, well drained, moderately sloping to very steep, loamy soils on uplands

This association is on uplands characterized by rimrock, by moderately sloping to very steep areas, and by deeply dissected drainageways. The Cave Hills make up part of the association. The drainage pattern is well defined.

This association makes up about 2 percent of the county. It is about 40 percent Cabba soils, 20 percent Rock outcrop, and 40 percent minor soils.

The shallow Cohagen soils are on side slopes. Slopes range from 6 to 60 percent. Typically, the surface layer is light brownish gray, calcareous fine sandy loam. The underlying material is light gray, calcareous fine sandy loam. Soft, calcareous sandstone and siltstone bedrock is at a depth of about 16 inches.

The Rock outcrop is in areas of rimrock and on the sides of deeply dissected drainageways. It is mainly

sandstone, but in some areas it is siltstone or clayey shale and has thin layers of soft lignite or hard porcellanite.

Minor in this association are the Daglum, Reeder, Rhoades, and Vebar soils. The sodium affected Daglum and Rhoades soils are in slight depressions on low side slopes. The moderately deep Reeder and Vebar soils are on smooth side slopes.

Nearly all of the acreage is range. Controlling wind erosion is the main management concern. This association is suited to range and to rangeland wildlife habitat. It generally is unsuited to cultivated crops and to tame pasture and hay because of the slope, the shallow depth to bedrock, and the Rock outcrop.

Nearly Level to Very Steep, Loamy Soils on Uplands

These soils dominantly are moderately sloping but are nearly level to gently sloping in places and are strongly sloping to very steep along some drainageways. They make up about 17 percent of the county. About 80 percent of the acreage is range. Controlling erosion and conserving moisture are the main management concerns.

14. Marmarth-Twilight-Cabbart Association

Moderately deep and shallow, well drained, gently sloping to very steep, loamy soils on uplands

This association is on uplands characterized by smooth, gently sloping areas and by more sloping areas that are deeply dissected. In most areas the drainage pattern is well defined.

This association makes up about 6 percent of the county. It is about 35 percent Marmarth soils, 25 percent Twilight and similar soils, 20 percent Cabbart soils, and 20 percent minor soils.

The moderately deep Marmarth soils are on the low parts of the landscape. Slopes range from 2 to 15 percent. Typically, the surface layer is brown fine sandy loam. The subsoil is brown, grayish brown, and light brownish gray sandy clay loam, loam, and fine sandy loam. It is calcareous in the lower part. Weakly cemented sandstone is at a depth of about 35 inches.

The moderately deep Twilight soils are on side slopes. Slopes range from 6 to 25 percent. Typically, the surface layer is grayish brown fine sandy loam. The subsoil is brown and yellowish brown fine sandy loam and sandy loam. The underlying material is light olive brown sandy loam. Soft sandstone and shale bedrock is at a depth of about 30 inches.

The shallow Cabbart soils are on ridges and the upper side slopes. Slopes range from 6 to 60 percent. Typically, the surface layer is light yellowish brown, calcareous loam. The subsoil is pale yellow, calcareous loam. Soft bedrock is at a depth of about 11 inches.

Minor in this association are the sodium affected Bullock and Parchin soils and Slickspots in small pits and depressions on the smoother parts of the landscape. Slickspots have a puddled or slick surface. They generally do not support vegetation.

About 85 percent of this association is range. Some areas are cultivated. Alfalfa, small grain, and tame grasses are the main crops. Controlling water erosion and conserving moisture are the main management concerns. The association is suited to range and to rangeland wildlife habitat. The less sloping areas of the Marmarth and Twilight soils are suited to cultivated crops and to tame pasture and hay. The Cabbart soils generally are unsuited, however, because they are shallow over bedrock.

15. Amor-Cabba Association

Moderately deep and shallow, well drained, nearly level to moderately steep, loamy soils on uplands

This association is on uplands characterized by gentle slopes and low ridges and by more sloping areas that are deeply dissected. The drainage pattern is well defined.

This association makes up about 9 percent of the county. It is about 35 percent Amor soils, 25 percent Cabba soils, and 40 percent minor soils.

The moderately deep Amor soils generally are on the smoother parts of the landscape. Slopes range from 0 to 15 percent. Typically, the surface layer is grayish brown loam. The subsoil is light olive brown, grayish brown, and light brownish gray loam. It is calcareous in the lower part. Light gray, calcareous, soft sandstone is at a depth of about 34 inches.

The shallow Cabba soils are on the upper side slopes and ridges. Slopes range from 6 to 25 percent. Typically, the surface layer is light grayish brown, calcareous loam. The subsoil is light brownish gray and light yellowish brown, calcareous loam. The underlying material is light yellowish brown, calcareous loam. Soft sandstone is at a depth of about 15 inches.

Minor in this association are the Arnegard, Daglum, Farland, Grail, Korchea, and Rhoades soils. The deep Arnegard and Grail soils are in swales. The sodium affected Daglum and Rhoades soils are on side slopes and in narrow valleys. The deep Farland soils are in positions on the landscape similar to those of the Amor soils. The deep Korchea soils are on narrow flood plains.

About 75 percent of this association is range. Many of the less sloping areas are cultivated. Alfalfa and small grain are the main crops. Controlling water erosion and conserving moisture are the main management concerns. The association is suited to range and to rangeland wildlife habitat. The Amor soils are suited to cultivated crops and to tame pasture and hay. The Cabba soils generally are unsuited, however, because they are shallow over bedrock.

16. Vebar-Cohagen Association

Moderately deep and shallow, well drained, gently sloping to moderately steep, loamy soils on uplands

This association is on uplands characterized by smooth, gently sloping areas and by more sloping areas that are deeply dissected. In most areas the drainage pattern is well defined.

This association makes up about 2 percent of the county. It is about 30 percent Vebar soils, 25 percent Cohagen soils, and 45 percent minor soils.

The moderately deep Vebar soils generally are on the less sloping parts of the landscape. Slopes range from 2 to 25 percent. Typically, the surface layer is dark grayish brown fine sandy loam. The subsoil is brown, light olive brown, and light brownish gray fine sandy loam. It is calcareous in the lower part. Light brownish gray and light gray, soft sandstone is at a depth of about 32 inches.

The shallow Cohagen soils are on ridges. Slopes range from 6 to 25 percent. Typically, the surface layer is light brownish gray, calcareous fine sandy loam. The underlying material is light gray, calcareous fine sandy loam. Soft sandstone is at a depth of about 16 inches.

Minor in this association are the Amor, Daglum, Parshall, and Rhoades soils. Amor soils are in positions on the landscape similar to those of the Vebar soils. They have a surface layer and subsoil of loam. The sodium affected Daglum and Rhoades soils are on small flats and in small pits. The deep Parshall soils are in swales. They are dark to a depth of more than 16 inches.

About 70 percent of this association is range. Some of the less sloping areas of the Vebar soils are cultivated. Alfalfa, small grain, and tame grasses are the main crops. Controlling wind erosion and conserving moisture are the main management concerns. The association is suited to range and to rangeland wildlife habitat. The less sloping areas of the Vebar soils are suited to cultivated crops and to tame pasture and hay, but the Cohagen soils generally are not suited because they are shallow over bedrock.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Amor loam, 2 to 6 percent slopes, is a phase of the Amor series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Kremlin-Archin complex, 0 to 3 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Slickspots is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

The names of some map units identified on the detailed soil maps do not fully agree with those identified on the maps in the published surveys of Butte and Perkins Counties, which are adjacent to this county. Differences are the result of variations in the design and composition of the map units or changes and refinements in series concepts.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

AaA—Amor loam, 0 to 2 percent slopes. This moderately deep, well drained, nearly level soil is on uplands. Areas are irregular in shape and 10 to 100 acres in size.

Typically, the surface layer is grayish brown loam about 8 inches thick. The subsoil is loam about 26 inches thick. The upper part is grayish brown and light olive brown and is friable, and the lower part is light brownish gray, friable and very friable, and calcareous. Light gray, calcareous, soft sandstone is at a depth of about 34 inches. In places the subsoil contains more clay. In some areas the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Arnegard, Grail, Lantry, and Werner soils. These soils make up less than 15 percent of any one mapped area. The deep Arnegard and Grail soils are dark to a depth of more than 16 inches. They are in swales and drainageways. Lantry and Werner soils are on ridges. The surface layer of the Lantry soils is not so dark as that of the Amor soil. Werner soils are 10 to 20 inches deep over sandstone.

Organic matter content is moderate in the Amor soil, and fertility is medium. Tilth is good. Permeability is

moderate. Available water capacity is low or moderate. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, crested wheatgrass, and intermediate wheatgrass are examples of suitable pasture plants. Alfalfa, spring wheat, winter wheat, oats, and barley are the main cultivated crops. A small acreage of corn and sorghum is harvested for silage. Measures that conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and minimizing tillage.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the moderate depth to bedrock is a limitation. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIc-2; Silty range site; windbreak suitability group 6R.

AaB—Amor loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape and l0 to more than 250 acres in size.

Typically, the surface layer is grayish brown loam about 8 inches thick. The subsoil is loam about 26 inches thick. The upper part is grayish brown and light olive brown and is friable, and the lower part is light brownish gray, friable and very friable, and calcareous. Light gray, calcareous, soft sandstone is at a depth of about 34 inches. In places the subsoil contains more clay. In some areas the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Arnegard, Grail, Lantry, Vebar, and Werner soils. These soils make up less than 15 percent of any one mapped area. The deep Arnegard and Grail soils are dark to a depth of more than 16 inches. They are in swales. Lantry and Werner soils are on ridges. The surface layer of the Lantry soils is not so dark as that of the Amor soil. Werner soils are 10 to 20 inches deep over soft bedrock. Vebar soils have more sand and less silt in the subsoil than the Amor soil. They are intermingled with areas of the Amor soil.

Organic matter content is moderate in the Amor soil, and fertility is medium. Tilth is good. Permeability is moderate. Available water capacity is low or moderate. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage supports native grasses. No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay, but it is somewhat droughty. Intermediate wheatgrass, alfalfa, and crested wheatgrass are examples of suitable pasture plants. Winter wheat, spring wheat, barley, oats, and alfalfa are the main cultivated crops. A small acreage of corn and sorghum is harvested for silage. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and farming on the contour.

This soil is suited to windbreaks and environmental plantings, but the moderate depth to bedrock is a limitation. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIe-1; Silty range site; windbreak suitability group 6R.

AcC—Amor-Cabba loams, 6 to 9 percent slopes. These well drained, moderately sloping soils are on uplands. The moderately deep Amor soil is on low side slopes. The shallow Cabba soil is on ridges. Areas are irregular in shape and l0 to more than 200 acres in size. They are 50 to 65 percent Amor soil and 20 to 30 percent Cabba soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Amor soil is grayish brown loam about 8 inches thick. The subsoil is loam about 26 inches thick. The upper part is grayish brown and light olive brown and is friable, and the lower part is light brownish gray, very friable and friable, and calcareous. Light gray, calcareous, soft sandstone is at a depth of about 34 inches. In places the subsoil contains more clay. In some areas the depth to sandstone is more than 40 inches.

Typically, the surface layer of the Cabba soil is light brownish gray, calcareous loam about 2 inches thick. The subsoil is light brownish gray and light yellowish brown, friable, calcareous loam about 6 inches thick. The underlying material is light yellowish brown, calcareous loam. Light gray and light brownish gray, calcareous, soft sandstone is at a depth of about 15 inches. In some areas the soil contains more sand throughout.

Included with these soils in mapping are small areas of Arnegard, Daglum, Grail, Rhoades, and Vebar soils. These included soils make up less than 25 percent of any one mapped area. Arnegard and Grail soils are dark to a depth of more than 16 inches. They are in swales. The sodium affected Daglum and Rhoades soils are on small flats and in small pits and depressions. Vebar soils contain more sand and less clay throughout than the Amor soil. They are in positions on the landscape similar to those of the Amor soil.

The content of organic matter is moderate in the Amor soil and low in the Cabba soil. Fertility is medium in the Amor soil and low in the Cabba soil. Tilth is good in the

Amor soil and fair in the Cabba soil. Permeability is moderate in both soils. Available water capacity is low or moderate in the Amor soil and very low in the Cabba soil. Runoff is medium on both soils. The shrink-swell potential is moderate in the Amor soil and low in the Cabba soil.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Water erosion is a hazard, however, if the range is overgrazed. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Alfalfa and intermediate wheatgrass are examples of pasture plants that are suited to the Amor soil. No pasture plants are suited to the shallow Cabba soil. Spring wheat, winter wheat, barley, and oats are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, including grasses and legumes in the cropping system, and farming on the contour.

The Amor soil is suited to windbreaks and environmental plantings, but the Cabba soil is generally unsuited. The depth to bedrock in both soils is a limitation. Windbreaks can be established on the Amor soil, but optimum growth is unlikely. No trees or shrubs grow well on the Cabba soil. Planting on the contour helps to control erosion.

The Amor soil is in capability unit IIIe-2, Silty range site, and windbreak suitability group 6R; the Cabba soil is in capability unit VIe-11, Shallow range site, and windbreak suitability group 10.

AdC—Amor-Rhoades loams, 6 to 9 percent slopes. These moderately deep, well drained, moderately sloping soils are on uplands. The Amor soil is on convex slopes. The sodium affected Rhoades soil is in small pits and depressions, generally on low side slopes. Areas are irregular in shape and 10 to more than 100 acres in size. They are 50 to 60 percent Amor soil and 20 to 30 percent Rhoades soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Amor soil is grayish brown loam about 8 inches thick. The subsoil is loam about 26 inches thick. The upper part is grayish brown and light olive brown and is friable, and the lower part is light brownish gray, very friable and friable, and calcareous. Light gray, calcareous, soft sandstone is at a depth of about 34 inches. In places the subsoil contains more clay. In some areas the depth to sandstone is more than 40 inches.

Typically, the surface layer of the Rhoades soil is grayish brown loam about 2 inches thick. The subsoil is about 30 inches of firm, grayish brown silty clay and silty clay loam. In the lower part it is calcareous and has nests of gypsum and other salts. Soft sandstone is at a depth of about 32 inches. In places the surface layer is fine sandy loam. In some areas the subsoil contains less clay.

Included with these soils in mapping are small areas of Cabba, Daglum, Grail, and Lantry soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. The calcareous Cabba and Lantry soils are on ridges. The deep Daglum soils and the Slickspots are intermingled with areas of the Rhoades soil. The Slickspots have a dispersed surface and have a high content of salts throughout. They do not support vegetation. Grail soils are dark to a depth of more than 16 inches. They are in swales.

Organic matter content is moderate in the Amor and Rhoades soils. Fertility is medium in the Amor soil and low in the Rhoades soil. Tilth is good in the Amor soil and poor in the Rhoades soil. The Rhoades soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is moderate in the Amor soil and very slow in the Rhoades soil. Available water capacity is low or moderate in the Amor soil and low in the Rhoades soil. Runoff is medium on both soils. The shrink-swell potential is moderate in the Amor soil and high in the Rhoades soil.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of these soils for range; however, the Rhoades soil is subject to compaction.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Crop growth is severely restricted on the Rhoades soil because of the dense, sodium affected subsoil. Intermediate wheatgrass and alfalfa are examples of suitable pasture plants. Winter wheat, spring wheat, alfalfa, and oats are the main cultivated crops. Measures that control erosion, conserve moisture, and improve tilth are the main management needs in cultivated areas. Examples are terracing, farming on the contour, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake.

This map unit is suited to windbreaks and environmental plantings, but the moderate depth to bedrock in the Amor soil and the sodium affected subsoil in the Rhoades soil are limitations. Windbreaks can be established on the Amor soil, but optimum growth is unlikely. No trees or shrubs grow well on the Rhoades soil. Planting on the contour helps to control erosion.

The Amor soil is in capability unit IIIe-2, Silty range site, and windbreak suitability group 6R; the Rhoades soil is in capability unit VIs-1, Thin Claypan range site, and windbreak suitability group 10.

AeB—Amor-Werner loams, 2 to 6 percent slopes. These well drained, gently sloping soils are on uplands. The moderately deep Amor soil is on low side slopes. The shallow Werner soil is on ridges. Areas are irregular in shape and 10 to more than 100 acres in size. They are 45 to 55 percent Amor soil and 20 to 30 percent Werner soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Amor soil is grayish brown loam about 8 inches thick. The subsoil is loam about 26 inches thick. The upper part is grayish brown and light olive brown and is friable, and the lower part is light brownish gray, friable and very friable, and calcareous. Light gray, calcareous, soft sandstone is at a depth of about 34 inches. In places the subsoil contains more clay. In some areas the depth to sandstone is more than 40 inches.

Typically, the surface layer of the Werner soil is grayish brown, calcareous loam about 6 inches thick. The next layer is light brownish gray, calcareous loam about 7 inches thick. White, calcareous, hard sandstone is at a depth of about 13 inches.

Included with these soils in mapping are small areas of Arnegard, Grail, and Vebar soils. These included soils make up less than 20 percent of any one mapped area. Arnegard and Grail soils are dark to a depth of more than 16 inches. They are in swales. The moderately deep Vebar soils contain more sand throughout than the Amor soil. They are in positions on the landscape similar to those of the Amor soil.

Organic matter content is moderate in the Amor and Werner soils. Fertility is medium in the Amor soil and low in the Werner soil. Tilth is good in both soils. Permeability is moderate. Available water capacity is low or moderate in the Amor soil and very low in the Werner soil. The shrink-swell potential is moderate in both soils.

About half of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Crested wheatgrass and intermediate wheatgrass are examples of pasture plants that are suited to the Amor soil. No pasture plants are suited to the shallow Werner soil. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system.

The Amor soil is suited to windbreaks and environmental plantings, but the Werner soil is generally unsuited. The depth to bedrock in both soils is a limitation. Windbreaks can be established on the Amor soil, but optimum growth is unlikely. No trees or shrubs grow well on the Werner soil.

The Amor soil is in capability unit IIe-1, Silty range site, and windbreak suitability group 6R; the Werner soil is in capability unit VIe-11, Shallow range site, and windbreak suitability group 10.

AkA—Archin-Bullock fine sandy loams, 0 to 4 percent slopes. These deep, well drained, nearly level and very gently sloping soils are on terraces and fans. The Archin soil is on slight rises. The Bullock soil generally is in small pits and depressions. Areas are irregular in shape and 10 to more than 250 acres in size. They are 40 to 55 percent Archin soil and 20 to 30 percent Bullock soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Archin soil is grayish brown fine sandy loam about 4 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, friable loam about 22 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous loam that has nests of gypsum crystals and other salts. In some areas the subsoil contains more clay.

Typically, the surface layer of the Bullock soil is grayish brown and light brownish gray fine sandy loam about 4 inches thick. The subsoil is about 16 inches thick. It is firm. The upper part is grayish brown sandy clay loam. The lower part is light brownish gray, calcareous sandy clay loam, loam, and clay loam. It has gypsum crystals and other visible salts. The underlying material to a depth of 60 inches is light olive gray, calcareous fine sandy loam. It has gypsum crystals and other salts throughout. In some areas the subsoil contains more clay.

Included with these soils in mapping are small areas of Assinniboine, Chinook, Eapa, and Kremlin soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Assinniboine, Chinook, Eapa, and Kremlin soils do not have a sodium affected subsoil. They are slightly higher on the landscape than the Archin and Bullock soils. Slickspots have a dispersed surface layer and generally do not support vegetation. They are in small pits and depressions.

The content of organic matter and fertility are low in the Archin and Bullock soils. The sodium affected subsoil restricts the penetration of plant roots. Tilth is poor. Permeability is slow or very slow in the Archin soil and very slow in the Bullock soil. Available water capacity is moderate in both soils. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem on the Bullock soil. Wind erosion is a hazard in overgrazed

areas of the Archin soil. Range seeding is needed on some sites.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Crop growth is severely restricted on the Archin soil because of the dense, sodium affected subsoil. No crops grow well on the Bullock soil. Western wheatgrass and crested wheatgrass are examples of suitable pasture plants. Alfalfa, spring wheat, winter wheat, and oats are the main cultivated crops. Measures that conserve moisture and improve tilth are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake.

The Archin soil is suited to windbreaks and environmental plantings, but the Bullock soil is generally unsuited. The sodium affected subsoil in both soils restricts the penetration of plant roots. Trees and shrubs can be established on the Archin soil, but optimum survival, growth, and vigor are unlikely. No trees or shrubs grow well on the Bullock soil.

The Archin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9; the Bullock soil is in capability unit VIs-3, Thin Claypan range site, and windbreak suitability group 10.

Ar—Arnegard loam. This deep, well drained, nearly level soil is on foot slopes and in swales on uplands. It is occasionally flooded. Areas are long and narrow and 10 to more than 50 acres in size.

Typically, the surface layer is dark grayish brown loam about 9 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable loam about 35 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous loam. In places the subsoil contains more clay. In some areas soft bedrock is at a depth of 25 to 40 inches.

Included with this soil in mapping are small areas of Amor, Daglum, Rhoades, and Vebar soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The moderately deep Amor and Vebar soils are higher on the landscape than the Arnegard soil. The sodium affected Daglum and Rhoades soils are in small pits and depressions. Slickspots are in small pits and depressions. They have a dispersed surface and a high content of salts. They do not support vegetation.

The content of organic matter and fertility are high in the Arnegard soil. Tilth is good. Permeability is moderate. Available water capacity is high. A seasonal high water table is at a depth of 3 to 6 feet. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, crested wheatgrass, intermediate wheatgrass, and smooth bromegrass are examples of suitable pasture plants. Alfalfa, spring wheat, winter wheat, and oats are the main cultivated crops. Measures that conserve moisture during dry periods are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and minimizing tillage. In some years fieldwork is delayed because the soil receives runoff from adjacent soils, but in most years the additional moisture is beneficial.

This soil is well suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Those that require an abundant supply of moisture grow especially well.

The capability unit is IIc-3; Loamy Overflow range site; windbreak suitability group 1.

AsA—Assinniboine fine sandy loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on terraces and uplands. Areas are irregular in shape and 20 to more than 150 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 8 inches thick. The subsoil is about 35 inches thick. It is friable. It is brown loam and sandy clay loam in the upper part and calcareous, grayish brown fine sandy loam in the lower part. The underlying material to a depth of 60 inches is grayish brown, calcareous loamy sand. In some places the dark colors extend below a depth of 16 inches. In other places the soil does not have carbonates within a depth of 60 inches. In some areas soft bedrock is at a depth of 20 to 40 inches. In other areas the subsoil and underlying material contain more clay and less sand.

Included with this soil in mapping are small areas of Archin, Bullock, and Kremlin soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The sodium affected Archin and Bullock soils are on small flats and in small pits and depressions. Kremlin soils are in positions on the landscape similar to those of the Assinniboine soil. They have less sand and more silt in the subsoil than the Assinniboine soil. Slickspots are in small pits and depressions. They have a dispersed surface and a high content of salts throughout. They do not support vegetation.

The content of organic matter is moderate in the Assinniboine soil, and fertility is medium. Tilth is fair. Permeability is moderate in the subsoil and moderately rapid in the underlying material. Available water capacity is moderate. Runoff is slow. The shrink-swell potential is low.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed.

Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Crested wheatgrass and intermediate wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Controlling wind erosion and conserving moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, stripcropping, and minimizing tillage. Establishing field windbreaks also helps to control wind erosion.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Preparing the site for planting in the spring helps to control wind erosion.

The capability unit is IIIe-4; Sandy range site; windbreak suitability group 5.

AsB—Assinniboine fine sandy loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on fans, terraces, and uplands. Areas are irregular in shape and 10 to 80 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 8 inches thick. The subsoil is about 35 inches thick. It is friable. It is brown loam and sandy clay loam in the upper part and grayish brown, calcareous fine sandy loam in the lower part. The underlying material to a depth of 60 inches is grayish brown, calcareous loamy sand. In some areas soft bedrock is at a depth of 20 to 40 inches. In places the subsoil and underlying material contain more clay and less sand.

Included with this soil in mapping are small areas of Archin, Arnegard, Bullock, and Gerdrum soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Archin, Bullock, and Gerdrum soils have a sodium affected subsoil. Archin and Gerdrum soils are on small flats. Bullock soils are in small pits and depressions. Arnegard soils are dark to a depth of more than 16 inches. They are in swales. Slickspots are in small pits and depressions. They have a dispersed surface and a high content of salts throughout. They generally do not support vegetation.

The content of organic matter is moderate in the Assinniboine soil, and fertility is medium. Tilth is fair. Permeability is moderate in the subsoil and moderately rapid in the underlying material. Available water capacity is moderate. Runoff is slow or medium. The shrink-swell potential is low.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Crested wheatgrass and intermediate wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that control wind erosion and conserve moisture are the main management needs in cultivated areas. Examples are stripcropping, minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Establishing field windbreaks also helps to control wind erosion.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Planting on the contour helps to control water erosion. Preparing the site for planting in the spring helps to control wind erosion.

The capability unit is IVe-6; Sandy range site; windbreak suitability group 5.

AtA—Assinniboine-Archin fine sandy loams, 0 to 3 percent slopes. These deep, well drained, nearly level soils are on terraces and fans. The Assinniboine soil is on the higher parts of the landscape. The Archin soil is in small depressions. Areas are 30 to more than 150 acres in size. They are 50 to 60 percent Assinniboine soil and 20 to 30 percent Archin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Assinniboine soil is grayish brown fine sandy loam about 8 inches thick. The subsoil is about 35 inches thick. It is friable. It is brown loam and sandy clay loam in the upper part and grayish brown, calcareous fine sandy loam in the lower part. The underlying material to a depth of 60 inches is grayish brown, calcareous loamy sand. In some areas the subsoil contains less clay. In places the soil is dark to a depth of more than 16 inches.

Typically, the surface layer of the Archin soil is grayish brown fine sandy loam about 4 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, friable loam about 22 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous loam. In some areas the subsoil contains more clay.

Included with these soils in mapping are small areas of Attewan, Bullock, Gerdrum, and Marmarth soils. These included soils make up less than 25 percent of any one mapped area. Attewan soils are 20 to 40 inches deep to sand and gravel. They are on knolls. Bullock and Gerdrum soils have a surface layer that is thinner than that of the Archin soil. They are in small pits and depressions. Marmarth soils are 20 to 40 inches deep over soft bedrock. They are higher on the landscape than the Assinniboine soil.

The content of organic matter is moderate and fertility medium in the Assinniboine soil. The content of organic matter and fertility are low in the Archin soil. The Archin soil has a sodium affected subsoil that restricts the penetration of plant roots. Tilth is fair in the Assinniboine soil and poor in the Archin soil. Permeability is moderate in the upper part of the Assinniboine soil and moderately rapid in the underlying material. It is slow or very slow in the Archin soil. Available water capacity is moderate in both soils. Runoff is slow. The shrink-swell potential is low in the Assinniboine soil and moderate in the Archin soil.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Archin soil is a limitation. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, alfalfa, winter wheat, and oats are the main cultivated crops. Measures that control wind erosion, conserve moisture, and improve tilth are the main management needs in cultivated areas. Examples are stripcropping, leaving crop residue on the surface, and including grasses and legumes in the cropping system.

These soils are suited to windbreaks and environmental plantings, but the sodium affected subsoil in the Archin soil is a limitation. Windbreaks can be established on the Archin soil, but optimum growth is unlikely. Preparing the site for planting in the spring helps to control wind erosion.

The Assinniboine soil is in capability unit IIIe-4, Sandy range site, and windbreak suitability group 5; the Archin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9.

AwB—Attewan loam, 2 to 6 percent slopes. This well drained, undulating soil is on terraces and upland fans. It is moderately deep to gravelly material. In some areas scattered stones are on the surface. Areas are irregular in shape and 10 to more than 100 acres in size.

Typically, the surface layer is brown loam about 5 inches thick. The subsoil is about 27 inches thick. It is grayish brown and friable. It is clay loam and loam in the upper part and calcareous sandy clay loam in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous, stratified very gravelly loamy sand and very gravelly loam. In places it is gravelly loam. In some areas the depth to the gravelly underlying material is more than 40 inches.

Included with this soil in mapping are small areas of Archin, Bullock, and Nihill Variant soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Archin and Bullock soils have a sodium affected subsoil. They are on small flats and in small pits and depressions. Nihill Variant soils are 10 to 20 inches deep over sand and gravel. They are higher on the landscape than the Attewan soil. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits and depressions.

The content of organic matter is moderate in the Attewan soil, and fertility is medium. Tilth is good. Permeability is moderate in the subsoil and rapid in the underlying material. Available water capacity is low. Runoff is slow or medium. The shrink-swell potential is moderate in the subsoil and low in the underlying material.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range; however, the soil is droughty. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay, but it is droughty. Intermediate wheatgrass and crested wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system.

This soil is suited to windbreaks and environmental plantings. Optimum growth is unlikely, however, because the soil is droughty.

The capability unit is IVe-2; Silty range site; windbreak suitability group 6G.

Ba—Badlands. This map unit consists of moderately sloping to nearly vertical exposures of soft bedrock dissected by many intermittent drainageways. In many areas thin seams of lignite are throughout the bedrock. Areas range from 10 to 100 acres in size.

Included with the Badlands in mapping are small areas of Archin, Blackhall, Bullock, Cabbart, Glendive, Kirby, and Parchin soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The sodium affected Archin, Bullock, and Parchin soils are on small flats and in small pits and depressions. Blackhall and Cabbart soils are on the crest of narrow ridges. Glendive soils are along narrow drainageways. Kirby soils are on the steeper ridges. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits and depressions near areas of Bullock soils.

Runoff is very rapid on the Badlands. This map unit is subject to severe geologic erosion. It is unsuited to range, cultivated crops, tame pasture and hay, and

windbreaks and environmental plantings. Some of the included soils are used for limited grazing.

The capability unit is VIIIs-2; no range site or windbreak suitability group is assigned.

BeC—Boxwell loam, 6 to 9 percent slopes. This moderately deep, well drained, moderately sloping soil is on uplands. In some areas scattered stones are on the surface. Areas are irregular in shape and 10 to 40 acres in size.

Typically, the surface layer is light olive brown loam about 7 inches thick. The subsoil is light olive brown, light gray, and light yellowish brown, friable loam about 24 inches thick. It is calcareous in the lower part. Pale olive, soft sandstone is at a depth of about 31 inches. In places the depth to bedrock is more than 40 inches. In some areas the subsoil contains more clay.

Included with this soil in mapping are small areas of Bullock, Cabbart, Parchin, Rhame, and Twilight soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The sodium affected Bullock and Parchin soils are in small pits and depressions. The shallow Cabbart soils are on ridges. Rhame and Twilight soils are in positions on the landscape similar to those of the Boxwell soil. They have more sand and less clay in the subsoil than the Boxwell soil. Slickspots have a dispersed surface and a high content of salts throughout. They are in small pits.

The content of organic matter is moderate in the Boxwell soil, and fertility is medium. Tilth is good. Permeability is moderate. Available water capacity is low. Runoff is medium. The shrink-swell potential is low.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range. Erosion is a problem, however, along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent excessive soil loss. Proper stocking rates and timely deferment of grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are intermediate wheatgrass and alfalfa. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that control erosion and conserve moisture are the main management concerns in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system. Terraces and grassed waterways also help to control erosion.

This soil is suited to windbreaks and environmental plantings, but the moderate depth to bedrock is a limitation. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-1; Silty range site; windbreak suitability group 6R.

BkF—Bullock fine sandy loam, 6 to 20 percent slopes, extremely stony. This moderately deep, well drained, moderately sloping to moderately steep soil is on uplands. Scattered stones and boulders are on the surface. Areas are irregular in shape and 10 to 50 acres in size.

Typically, the surface layer is grayish brown and light brownish gray fine sandy loam about 4 inches thick. It has many stones. The subsoil is about 16 inches thick. It is firm. The upper part is grayish brown sandy clay loam. The lower part is light brownish gray and light gray, calcareous loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material is light olive gray, calcareous very fine sandy loam that has nests of gypsum crystals and other salts throughout. Light gray, soft sandstone is at a depth of about 29 inches. In some areas the depth to sandstone is more than 40 inches.

Included with this soil in mapping are small areas of Archin, Blackhall, Cabbart, Marmarth, Parchin, Rhame, and Twilight soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Archin and Parchin soils are on small flats and are slightly higher on the landscape than the Bullock soil. Also, they have a thicker surface layer. The shallow Blackhall and Cabbart soils are on ridges. The moderately deep Marmarth, Rhame, and Twilight soils do not have a sodium affected subsoil. They are higher on the landscape than the Bullock soil. Slickspots have a dispersed surface layer and a high amount of salts. They do not support vegetation. They are in small pits and depressions.

The content of organic matter and fertility are low in the Bullock soil. Tilth is poor. The sodium affected subsoil restricts the penetration of plant roots. Permeability is very slow. Available water capacity is low. Runoff is medium or rapid. The shrink-swell potential is moderate.

Nearly all of the acreage supports native grasses and is used for grazing. Productivity is low because the sodium affected subsoil restricts the penetration of roots. Water erosion is a hazard unless an adequate plant cover is maintained. Compaction is a problem. Reestablishing vegetation is difficult.

This soil is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The stony surface and the sodium affected subsoil are limitations.

The capability unit is VIIs-6; Thin Claypan range site; windbreak suitability group 10.

BnA—Bullock-Assinniboine fine sandy loams, 0 to 4 percent slopes. These deep, well drained, nearly level and very gently sloping soils are on terraces. The sodium affected Bullock soil is in small pits and depressions. The Assinniboine soil is on the smooth parts of the landscape. Areas are irregular in shape and 10 to 130

acres in size. They are 50 to 60 percent Bullock soil and 25 to 30 percent Assinniboine soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Bullock soil is grayish brown and light brownish gray fine sandy loam about 4 inches thick. The subsoil is about 16 inches thick. It is firm. The upper part is grayish brown sandy clay loam. The lower part is light brownish gray and light gray, calcareous loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light olive gray, calcareous fine sandy loam. It has accumulations of gypsum crystals and other salts throughout. In places the subsoil contains more clay.

Typically, the surface layer of the Assinniboine soil is grayish brown fine sandy loam about 8 inches thick. The subsoil is about 35 inches thick. It is friable. It is brown loam and sandy clay loam in the upper part and grayish brown, calcareous fine sandy loam in the lower part. The underlying material to a depth of 60 inches is grayish brown, calcareous loamy sand. In places the surface layer is loam. In some areas the subsoil contains less clay.

Included with these soils in mapping are small areas of Archin and Chinook soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Archin soils have a surface layer that is thicker than that of the Bullock soil. Also, they are slightly higher on the landscape. Chinook soils do not have a sodium affected subsoil. They contain less clay in the subsoil than the Assinniboine soil. They are in positions on the landscape similar to those of the Assinniboine soil. Slickspots have a dispersed surface and a high amount of salts throughout. They do not support vegetation. They are in small pits and depressions.

The content of organic matter and fertility are low in the Bullock soil. The content of organic matter is moderate and fertility medium in the Assinniboine soil. Tilth is poor in the Bullock soil and fair in the Assinniboine soil. The Bullock soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is very slow in the Bullock soil. It is moderate in the subsoil of the Assinniboine soil and moderately rapid in the underlying material. Available water capacity is moderate in both soils. The shrink-swell potential is moderate in the Bullock soil and low in the Assinniboine soil. Runoff is slow on both soils.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem on the Bullock soil. Productivity is low on this soil because the sodium affected subsoil restricts the penetration of roots. Wind erosion is a hazard on the Assinniboine soil. Proper stocking rates and timely deferment of grazing help to maintain maximum productivity.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings, mainly because of the sodium affected subsoil in the Bullock soil. Although the Assinniboine soil is suited to these uses, the use of the map unit is determined by the limitations of the Bullock soil. Environmental plantings can be established on the Assinniboine soil, but windbreaks are not effective because the trees and shrubs do not grow well on the Bullock soil.

The Bullock soil is in capability unit VIs-3, Thin Claypan range site, and windbreak suitability group 10; the Assinniboine soil is in capability unit IIIe-4, Sandy range site, and windbreak suitability group 5.

BoD—Bullock-Cabbart complex, 6 to 25 percent slopes. These well drained, moderately sloping to moderately steep soils are on uplands. The moderately deep, sodium affected Bullock soil is in small pits and on small flats. The shallow Cabbart soil is on ridges and along drainageways. In some areas scattered stones and boulders are on the surface. Areas are irregular in shape and 10 to more than 400 acres in size. They are 35 to 40 percent Bullock soil and 30 to 35 percent Cabbart soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Bullock soil is grayish brown and light brownish gray fine sandy loam about 4 inches thick. The subsoil is about 16 inches thick. It is firm. The upper part is grayish brown sandy clay loam. The lower part is light brownish gray and light gray, calcareous loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material is light olive gray, calcareous very fine sandy loam that has nests of gypsum crystals and other salts. Light gray, soft sandstone is at a depth of about 29 inches. In places the subsoil contains more clay. In some areas the depth to sandstone is more than 40 inches.

Typically, the surface layer of the Cabbart soil is light yellowish brown, calcareous loam about 4 inches thick. The subsoil is pale yellow, very friable, calcareous loam about 7 inches thick. Weakly consolidated layers of sandstone, siltstone, and shale are at a depth of about 11 inches. In some areas the surface layer and subsoil are fine sandy loam.

Included with these soils in mapping are small areas of Amor, Boxwell, Daglum, Delridge, Glendive, Marmarth, Parchin, Reeder, and Twilight soils and areas of Rock outcrop and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Amor, Boxwell, Marmarth, Reeder, and Twilight soils are lower on the landscape than the Cabbart soil. They are 20 to 40 inches deep over soft bedrock and do not have a sodium affected subsoil. Daglum and Parchin soils are on small flats and are slightly higher on the landscape than the Bullock soil. Also, they have a thicker surface

layer. The moderately deep Delridge soils are in positions on the landscape similar to those of the Cabbart soil. The stratified Glendive soils are along narrow drainageways. Rock outcrop occurs as rimrock and as terrace escarpments generally below the Cabbart soil. Slickspots have a dispersed surface and a high content of salts throughout. They are in small pits and depressions.

The content of organic matter and fertility are low in the Bullock and Cabbart soils. The Bullock soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is moderate in the Cabbart soil and very slow in the Bullock soil. Available water capacity is low in the Bullock soil and very low in the Cabbart soil. Runoff is rapid on both soils. The shrink-swell potential is moderate in the Bullock soil and low in the Cabbart soil.

Nearly all of the acreage supports native grasses and is used for grazing (fig. 5). Productivity is low on the Bullock soil because the sodium affected subsoil restricts the penetration of plant roots. Compaction also is a problem on this soil. The Cabbart soil is subject to water erosion unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. Most areas have many sites that can be used for stock water dams, but seepage is a hazard.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The sodium affected subsoil in the Bullock soil and the shallowness and slope of the Cabbart soil are limitations.

The Bullock soil is in capability unit VIs-3 and Thin Claypan range site; the Cabbart soil is in capability unit VIe-11 and Shallow range site; both soils are in windbreak suitability group 10.

BpB—Bullock-Parchin-Slickspots complex, 2 to 9 percent slopes. This map unit occurs as areas of

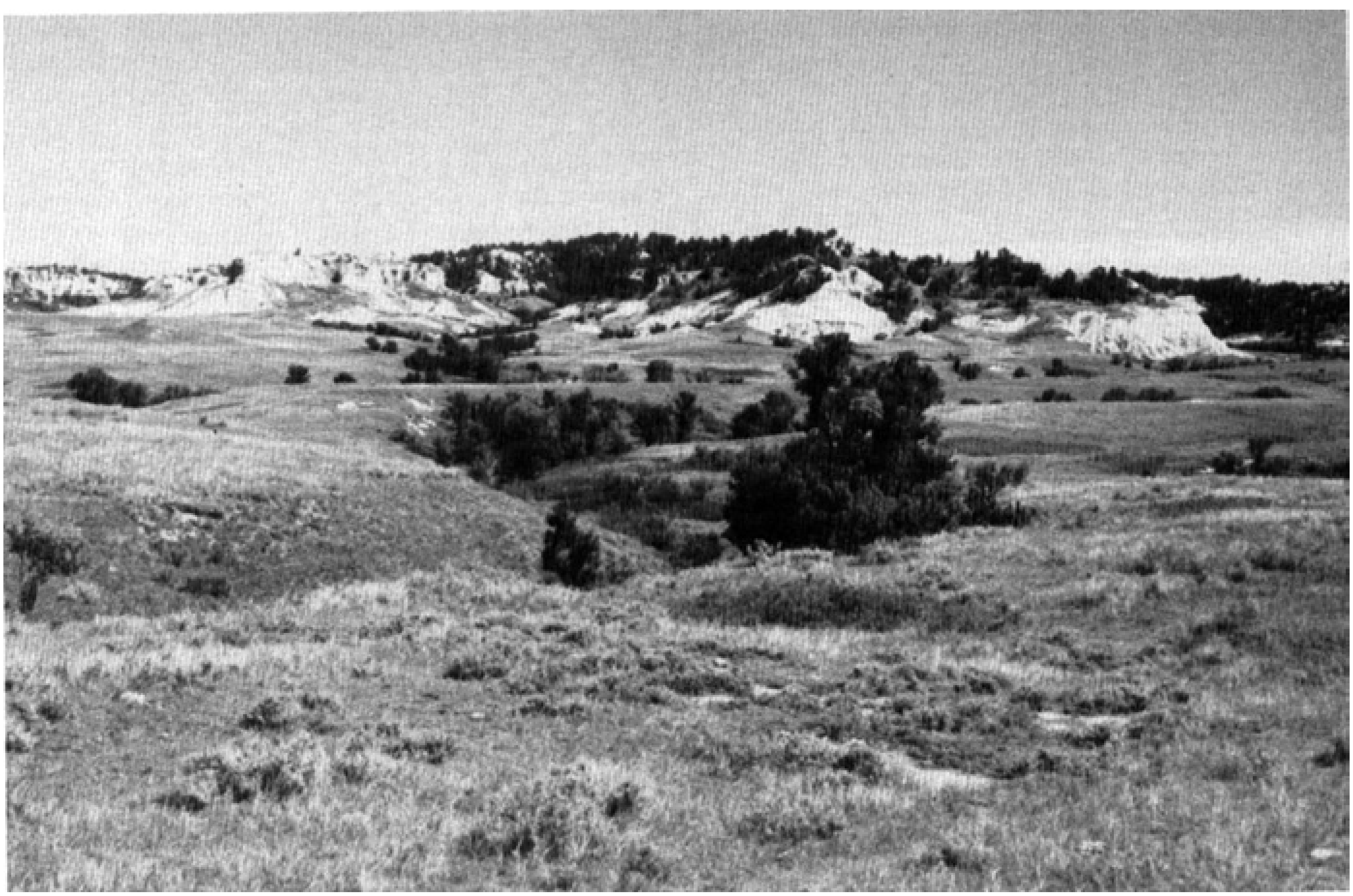

Figure 5.—An area of Bullock-Cabbart complex, 6 to 25 percent slopes, used as range. An area of Rock outcrop-Reva complex, 15 to 60 percent slopes, is in the background.

moderately deep, well drained, gently sloping and moderately sloping soils intermingled with Slickspots on uplands. The Bullock soil and Slickspots are in small pits and depressions. The Parchin soil is on slight rises. Areas are irregular in shape and 10 to more than 400 acres in size. They are 40 to 50 percent Bullock soil, 25 to 35 percent Parchin soil, and 15 to 25 percent Slickspots. The two soils and the Slickspots occur as areas so intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Bullock soil is grayish brown and light brownish gray fine sandy loam about 4 inches thick. The subsoil is about 16 inches thick. It is firm. The upper part is grayish brown sandy clay loam. The lower part is light brownish gray and light gray, calcareous loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material is light olive gray, calcareous very fine sandy loam that has nests of gypsum crystals and other salts. Light gray, soft sandstone is at a depth of about 29 inches. In places the subsoil contains more clay. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Parchin soil is grayish brown fine sandy loam about 5 inches thick. The surface layer is light brownish gray fine sandy loam about 5 inches thick. The subsoil is about 18 inches thick. It is firm. The upper part is brown sandy clay loam. The lower part is grayish brown and light brownish gray, calcareous sandy clay loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material is light gray, calcareous sandy clay loam. It has nests of gypsum crystals and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches. In places the subsoil contains more clay. In some areas the depth to bedrock is more than 40 inches.

The Slickspots occur as slightly depressional, barren areas that have a puddled or slick surface (fig. 6). Visible accumulations of salts are at or near the surface. The soil material to a depth of about 29 inches is massive clay loam.

Included with the Bullock and Parchin soils and Slickspots in mapping are small areas of Assinniboine, Chinook, Marmarth, Rhame, and Twilight soils. These included soils make up less than 25 percent of any one mapped area. They do not have a sodium affected subsoil. Assinniboine and Chinook soils are in positions on the landscape similar to those of the Bullock and Parchin soils. Rhame, Marmarth, and Twilight soils are slightly higher on the landscape than the Bullock and Parchin soils.

The content of organic matter and fertility are low in the Bullock and Parchin soils. Tilth is poor in both soils. These soils have a sodium affected subsoil that restricts the penetration of plant roots. Permeability is very slow in the Bullock soil and slow or very slow in the Parchin soil. Available water capacity is low in both soils. Runoff is slow. The shrink-swell potential is moderate in the Bullock soil. It is moderate in the subsoil of the Parchin soil and low in the underlying material.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem on the Bullock soil. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Wind erosion is a hazard in overgrazed areas of the Parchin soil. Slickspots generally support little or no vegetation, but they do support a sparse stand of weeds and pricklypear during wet periods. Proper stocking rates and timely deferment of grazing help to maintain maximum productivity.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. Although the Parchin soil is suited to these uses, the use of the map unit is determined by the suitability of the Bullock soil and the Slickspots. The sodium affected subsoil in both soils and the salts in the Slickspots are limitations.

The Bullock soil is in capability unit VIs-3, Thin Claypan range site, and windbreak suitability group 10; the Parchin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9; the Slickspots are in capability unit VIIIs-3 and are not assigned to a range site or windbreak suitability group.

BsA—Bullock-Slickspots complex, 0 to 4 percent slopes. This map unit occurs as areas of a moderately deep, well drained, nearly level and very gently sloping Bullock soil intermingled with Slickspots. The unit is on uplands. The Bullock soil is on slight rises. The Slickspots are in slight depressions. Areas are irregular in shape and 10 to more than 150 acres in size. They are 50 to 65 percent Bullock soil and 25 to 35 percent Slickspots. The Bullock soil and Slickspots occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Bullock soil is grayish brown and light brownish gray fine sandy loam about 4 inches thick. The subsoil is about 16 inches thick. It is firm. The upper part is grayish brown sandy clay loam. The lower part is light brownish gray and light gray, calcareous sandy clay loam, loam, and clay loam. It has nests of gypsum and other salts. The underlying material is light olive gray, calcareous very fine sandy loam that has nests of gypsum and other salts. Light gray, soft bedrock is at a depth of about 29 inches. In places the subsoil contains more clay. In some areas the depth to bedrock is more than 40 inches.

The Slickspots occur as slightly depressional, barren areas that have a puddled or slick surface. Visible accumulations of salts are at or near the surface. The soil material to a depth of about 29 inches is massive clay loam.

Included with the Bullock soil and Slickspots in mapping are small areas of Amor, Archin, Assinniboine,

Figure 6.—An area of Bullock-Parchin-Slickspots complex, 2 to 9 percent slopes. Slickspots support little or no vegetation.

Chinook, Kremlin, Parchin, Reeder, Rhame, and Twilight soils. These included soils make up less than 25 percent of any one mapped area. Amor, Assinniboine, Chinook, Kremlin, Reeder, Rhame, and Twilight soils do not have a sodium affected subsoil. They are higher on the landscape than the Bullock soil and Slickspots. Archin and Parchin soils are on slight rises. Archin soils are more than 40 inches deep over bedrock. Parchin soils have a surface soil that is thicker than that of the Bullock soil.

The content of organic matter and fertility are low in the Bullock soil. Tilth is poor. The sodium affected subsoil restricts the penetration of plant roots. Permeability is very slow. Available water capacity is low. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Proper stocking rates and timely deferment of grazing help to maintain maximum productivity. Slickspots generally support little or no vegetation, but they do support a sparse stand of weeds and pricklypear during wet periods.

This map unit is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The sodium affected subsoil of the Bullock soil and the salts in the Slickspots are limitations.

The Bullock soil is in capability unit VIs-3, Thin Claypan range site, and windbreak suitability group 10; the Slickspots are in capability unit VIIIs-3 and are not assigned to a range site or windbreak suitability group.

CaD—Cabba-Lantry-Amor loams, 9 to 25 percent slopes. These well drained, strongly sloping and moderately steep soils are on uplands. Scattered stones are on the surface in some areas. The shallow Cabba and moderately deep Lantry soils are on the upper side slopes and on ridges. The moderately deep Amor soil is

on the low side slopes. Areas are irregular in shape and 10 to more than 250 acres in size. They are 30 to 40 percent Cabba soil, 25 to 35 percent Lantry soil, and 20 to 30 percent Amor soil. The three soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Cabba soil is light brownish gray, calcareous loam about 2 inches thick. The subsoil is light brownish gray and light yellowish brown, friable, calcareous loam about 6 inches thick. The underlying material is light yellowish brown, calcareous loam. Soft sandstone is at a depth of about 15 inches. In some areas the soil contains more sand and less silt throughout.

Typically, the surface layer of the Lantry soil is grayish brown, calcareous loam about 4 inches thick. The subsoil is about 24 inches thick. It is friable and calcareous. It is light brownish gray loam in the upper part and light brownish gray and light gray silt loam in the lower part. Light gray, calcareous siltstone is at a depth of about 28 inches.

Typically, the surface layer of the Amor soil is grayish brown loam about 8 inches thick. The subsoil is loam about 26 inches thick. The upper part is grayish brown and light olive brown and is friable, and the lower part is light brownish gray, friable and very friable, and calcareous. Light gray, calcareous, soft sandstone is at a depth of about 34 inches. In places the subsoil contains more clay. In some areas the depth to sandstone is more than 40 inches.

Included with these soils in mapping are small areas of Daglum, Grail, Korchea, Rhoades, Tanna, and Vebar soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Daglum and Rhoades soils and Slickspots are in small pits and depressions. Daglum and Rhoades soils have a sodium affected subsoil. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. Grail soils are dark to a depth of more than 16 inches. They are in swales. Korchea soils are stratified. They are on narrow flood plains. Tanna and Vebar soils are in positions on the landscape similar to those of the Amor soil. Tanna soils contain more clay in the subsoil than the Amor soil. Vebar soils contain more sand and less silt throughout than the Amor and Lantry soils.

The content of organic matter is low in the Cabba and Lantry soils and moderate in the Amor soil. Fertility is low in the Cabba and Lantry soils and medium in the Amor soil. Tilth is poor in the Cabba and Lantry soils and good in the Amor soil. Permeability is moderate in all three soils. Available water capacity is very low in the Cabba soil, low in the Lantry soil, and low or moderate in the Amor soil. Runoff is medium or high on all three soils. The shrink-swell potential is low in the Cabba and Lantry soils and moderate in the Amor soil.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Water erosion is a hazard, however, if the range is overgrazed. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying. Suitable sites for stock water dams are available in many areas, but seepage is a hazard.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The slope, low fertility, and shallow depth to bedrock in the Cabba soil are the main limitations. The less sloping areas of the Amor soil can be seeded to tame pasture plants or used for environmental plantings.

The capability unit is VIe-11; the Cabba soil is in Shallow range site, the Lantry soil in Thin Upland range site, and the Amor soil in Silty range site; the Cabba and Lantry soils are in windbreak suitability group 10, the Amor soil in windbreak suitability group 6R.

CbD—Cabba-Reeder loams, 9 to 25 percent slopes. These well drained, strongly sloping and moderately steep soils are on uplands. The shallow Cabba soil is on ridges. The moderately deep Reeder soil is on side slopes. Areas are irregular in shape and 15 to 100 acres in size. They are 40 to 50 percent Cabba soil and 35 to 45 percent Reeder soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Cabba soil is light brownish gray, calcareous loam about 2 inches thick. The subsoil is light brownish gray and light yellowish brown, friable, calcareous loam about 6 inches thick. The underlying material is light yellowish brown, calcareous loam. Soft sandstone is at a depth of about 15 inches.

Typically, the surface layer of the Reeder soil is grayish brown loam about 6 inches thick. The subsoil is about 24 inches thick. It is friable. It is grayish brown and light brownish gray clay loam in the upper part and light gray, calcareous clay loam and loam in the lower part. Soft sandstone is at a depth of about 30 inches. In places the depth to bedrock is more than 40 inches.

Included with these soils in mapping are small areas of Daglum, Grail, and Rhoades soils and areas of Slickspots and Rock outcrop. These inclusions make up less than 20 percent of any one mapped area. Daglum and Rhoades soils and Slickspots are in small pits and depressions. Daglum and Rhoades soils have a sodium affected subsoil. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. Grail soils are dark to a depth of more than 16 inches. They are in swales. Rock outcrop occurs as rimrock and as escarpments.

The content of organic matter is low in the Cabba soil and moderate in the Reeder soil. Fertility is low in the Cabba soil and medium in the Reeder soil. Tilth is poor

in the Cabba soil and good in the Reeder soil. Permeability is moderate in both soils. Available water capacity is very low in the Cabba soil and low or moderate in the Reeder soil. Runoff is rapid on both soils. The shrink-swell potential is low in the Cabba soil and moderate in the Reeder soil.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard. In places gullies form along cattle trails. Reestablishing vegetation is difficult. Suitable sites for stock water dams are available in many areas, but seepage is a hazard.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings, mainly because of the shallow depth to bedrock in the Cabba soil. Although the Reeder soil is suited to these uses, the use of the map unit is determined by the limitations of the Cabba soil. The less sloping areas of the Reeder soil can be seeded to tame pasture plants or used for environmental plantings.

The capability unit is VIe-11; the Cabba soil is in Shallow range site and windbreak suitability group 10; the Reeder soil is in Silty range site and windbreak suitability group 6R.

CcE—Cabbart loam, 6 to 60 percent slopes, extremely stony. These shallow, well drained, moderately sloping to steep soils are on uplands. Many small to large stones and boulders are on the surface. Areas are irregular in shape and 10 to 100 acres in size.

Typically, the surface layer is light yellowish brown, calcareous extremely stony loam about 4 inches thick. The subsoil is pale yellow, very friable, calcareous loam about 7 inches thick. Weakly consolidated layers of sandstone, siltstone, and shale are at a depth of about 11 inches. In some areas the surface layer and subsoil are fine sandy loam.

Included with this soil in mapping are small areas of Amor, Bullock, Daglum, Marmarth, Rhame, Twilight, and Vebar soils. These soils make up less than 20 percent of any one mapped area. Amor, Marmarth, Rhame, Twilight, and Vebar soils are slightly lower on the landscape than the Cabba soil. They are 20 to 40 inches deep over soft bedrock. Bullock and Daglum soils are in small pits and depressions. They have a sodium affected subsoil.

The content of organic matter and fertility are low in the Cabbart soil. Tilth is poor. Permeability is moderate. Available water capacity is very low. Runoff is rapid. The shrink-swell potential is low.

Nearly all of the acreage supports native grasses and is used for grazing. Water erosion is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The shallow depth to bedrock, the slope, and the stoniness are the main limitations.

The capability unit is VIIs-6; Shallow range site; windbreak suitability group 10.

CdE—Cabbart-Delridge loams, 15 to 40 percent slopes. These well drained, moderately steep and steep soils are on uplands. The shallow Cabbart soil is on the upper side slopes and on ridges. The moderately deep Delridge soil is on the side slopes below the Cabbart soil. Scattered stones and boulders are on some ridges. Areas are irregular in shape and 10 to more than 300 acres in size. They are 50 to 55 percent Cabbart soil and 25 to 30 percent Delridge soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Cabbart soil is light yellowish brown, calcareous loam about 4 inches thick. The subsoil is pale yellow, very friable, calcareous loam about 7 inches thick. Weakly consolidated layers of sandstone, siltstone, and shale are at a depth of about 11 inches. In some areas the surface layer and subsoil are fine sandy loam.

Typically, the surface layer of the Delridge soil is brown loam about 5 inches thick. The subsoil is light gray, friable, calcareous loam about 10 inches thick. The underlying material is light brownish gray and light gray, calcareous loam. Weakly consolidated sandstone is at a depth of about 25 inches. In some areas the surface layer is darker.

Included with these soils in mapping are small areas of Bullock, Marmarth, Parchin, Rhame, and Twilight soils and areas of Rock outcrop and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Bullock and Parchin soils are in small pits and depressions. They have a sodium affected subsoil. Marmarth, Rhame, and Twilight soils are lower on the landscape than the Delridge soil. Also, Marmarth soils have a darker surface layer, and Rhame and Twilight soils have more sand and less clay in the subsoil. Rock outcrop is near the crests of narrow ridges. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter and fertility are low in the Cabbart and Delridge soils. Permeability is moderate. Available water capacity is very low in the Cabbart soil and low in the Delridge soil. Runoff is rapid on both soils. The shrink-swell potential is low in the Cabbart soil and moderate in the Delridge soil.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. Suitable sites for stock water dams are available in many areas, but seepage is a problem.

These soils are generally unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The slope of both soils and the

shallow depth to bedrock in the Cabbart soil are limitations.

The capability unit is VIIe-4, and the windbreak suitability group is 10; the Cabbart soil is in Shallow range site, the Delridge soil in Thin Upland range site.

CeE—Cabbart-Rock outcrop complex, 15 to 40 percent slopes. This map unit occurs as areas of a well drained, shallow, moderately steep and steep Cabbart soil intermingled with areas where bedrock crops out. The unit is on uplands. Scattered stones are on the surface in some areas. The Cabbart soil generally is on the upper side slopes and on ridges. The Rock outcrop is on the upper, convex slopes and on steep escarpments at the head of deeply dissected drainageways. Areas are irregular in shape and 10 to more than 500 acres in size. They are 40 to 60 percent Cabbart soil and 25 to 40 percent Rock outcrop. The Cabbart soil and Rock outcrop occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Cabbart soil is light yellowish brown, calcareous loam about 4 inches thick. The subsoil is pale yellow, very friable, calcareous loam about 7 inches thick. Weakly consolidated layers of sandstone, siltstone, and shale are at a depth of about 11 inches. In some areas the surface layer and subsoil are fine sandy loam.

The Rock outcrop is unweathered bedrock. It occurs as layers of sandstone, siltstone, or shale. Thin layers of lignite are in some exposures. In some areas the high parts of the Rock outcrop are fractured porcellanite.

Included with the Cabbart soil and Rock outcrop in mapping are small areas of Boxwell, Bullock, Glendive, Kirby, Marmarth, Parchin, Rhame, and Twilight soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Boxwell and Marmarth soils are on the lower side slopes. They have a dark surface layer and are 20 to 40 inches deep over soft bedrock. Bullock and Parchin soils are in small pits and depressions. They have a sodium affected subsoil. The deep, stratified Glendive soils are on narrow flood plains. Kirby soils are more than 40 inches deep over fractured porcellanite. They are on the crest of ridges near the Cabbart soil. The moderately deep Rhame and Twilight soils are lower on the landscape than the Cabbart soil. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter and fertility are low in the Cabbart soil. Permeability is moderate. Available water capacity is very low. Runoff is rapid. The shrink-swell potential is low.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The Rock outcrop is an additional limitation.

The Cabbart soil is in capability unit VIIe-4, Shallow range site, and windbreak suitability group 10; the Rock outcrop is in capability unit VIIIs-1 and is not assigned to a range site or windbreak suitability group.

ChA—Chinook fine sandy loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on fans and terraces. Areas are irregular in shape and 10 to 50 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 6 inches thick. The subsoil is brown and light brownish gray, very friable fine sandy loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light olive gray and light gray, calcareous fine sandy loam. In some areas soft bedrock is at a depth of 20 to 40 inches. In places the soil is dark to a depth of more than 16 inches.

Included with this soil in mapping are small areas of Archin, Attewan, Bullock, and Eapa soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Archin and Bullock soils are on small flats and in small pits. They have a sodium affected subsoil. Attewan and Eapa soils are in positions on the landscape similar to those of the Chinook soil. They contain more clay in the subsoil than the Chinook soil. Also, Attewan soils are 20 to 40 inches deep over gravelly material. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter is moderate in the Chinook soil, and fertility is medium. Tilth is fair. Permeability is moderately rapid. Available water capacity is moderate. Runoff is slow. The shrink-well potential is low.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main crops. Controlling wind erosion and conserving moisture are the main management needs in cultivated areas. Minimizing tillage, leaving crop residue on the surface, including grasses and legumes in the cropping system, and stripcropping help to control wind erosion

and conserve moisture. Establishing field windbreaks also helps to control wind erosion.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Preparing the site for planting in the spring helps to control wind erosion.

The capability unit is IIIe-4; Sandy range site; windbreak suitability group 5.

CnA—Chinook-Archin fine sandy loams, 0 to 3 percent slopes. These deep, well drained, nearly level soils are on fans and terraces. The Chinook soil is on the high parts of the landscape. The sodium affected Archin soil is on small flats. Areas are irregular in shape and 10 to 150 acres in size. They are 50 to 60 percent Chinook soil and 20 to 30 percent Archin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Chinook soil is grayish brown fine sandy loam about 6 inches thick. The subsoil is brown and light brownish gray, very friable fine sandy loam about 24 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light olive gray and light gray, calcareous fine sandy loam. In places the soil is dark to a depth of more than 16 inches. In some areas soft bedrock is at a depth of 20 to 40 inches.

Typically, the surface layer of the Archin soil is grayish brown fine sandy loam about 4 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, friable loam about 22 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous loam. In places the subsoil contains more clay. In some areas gravelly material is below a depth of 40 inches.

Included with these soils in mapping are small areas of Attewan, Bullock, Eapa, and Kremlin soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Attewan, Eapa, and Kremlin soils are in positions on the landscape similar to those of the Chinook soil. They contain more clay in the subsoil than the Chinook soil. Also, Attewan soils are 20 to 40 inches deep to gravelly material. Bullock soils and Slickspots are in small pits and depressions. Bullock soils have a surface layer that is thinner than that of the Archin soil. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter is moderate and fertility medium in the Chinook soil. The content of organic matter and fertility are low in the Archin soil. The sodium affected subsoil in the Archin soil restricts the penetration of plant roots. Tilth is fair in the Chinook soil and poor in the Archin soil. Permeability is moderately rapid in the Chinook soil and slow or very slow in the Archin soil. Available water capacity is moderate in both soils. Runoff is slow. The shrink-swell potential is low in the Chinook soil and moderate in the Archin soil.

Much of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Archin soil is a limitation. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that control wind erosion, conserve moisture, and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage, stripcropping, leaving crop residue on the surface, and including grasses and legumes in the cropping system.

These soils are suited to windbreaks and environmental plantings, but the sodium affected subsoil in the Archin soil is a limitation. Windbreaks can be established on the Archin soil, but optimum growth is unlikely. Preparing the site for planting in the spring helps to control wind erosion.

The Chinook soil is in capability unit IIIe-4, Sandy range site, and windbreak suitability group 5; the Archin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9.

CoE—Cohagen fine sandy loam, 15 to 50 percent slopes. This shallow, well drained, moderately steep to very steep soil is on uplands. Areas are irregular in shape and 15 to more than 150 acres in size.

Typically, the surface layer is light brownish gray, calcareous fine sandy loam about 4 inches thick. The underlying material is light gray, calcareous fine sandy loam. Soft sandstone and siltstone bedrock is at a depth of about 60 inches. In some areas the soil contains more silt and clay throughout.

Included with this soil in mapping are small areas of Amor, Daglum, Korchea, Rhoades, and Vebar soils and areas of Rock outcrop and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Amor and Vebar soils are on the sides of ridges. They are 20 to 40 inches deep over soft bedrock. Daglum and Rhoades soils and Slickspots are on small flats and in pits. Daglum and Rhoades soils have a sodium affected subsoil. Slickspots have a dispersed surface and a high content of salts. They do not support vegetation. They are in small pits. The deep Korchea soils are along narrow drainageways.

The content of organic matter and fertility are low in the Cohagen soil. Permeability is moderately rapid. Available water capacity is very low. Runoff is rapid.

All of the acreage supports native grasses and is used for grazing. Erosion by wind and water is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The shallow depth to bedrock and the slope are the main limitations.

The capability unit is VIIe-4; Shallow range site; windbreak suitability group 10.

CrF—Cohagen-Rock outcrop-Cabba Variant complex, 3 to 100 percent slopes. This map unit occurs as areas of well drained, shallow, gently sloping to very steep soils intermingled with areas of Rock outcrop. The Cohagen soil is on steep slopes below escarpments of hard sandstone. Scattered stones and boulders are on the surface in many areas. The Cabba Variant soil is in gently sloping areas on tableland above the sandstone escarpments. Areas are long and narrow and 20 to 150 acres in size. They are 50 to 60 percent Cohagen soil, 30 to 35 percent Rock outcrop, and 20 to 25 percent Cabba Variant soil. The two soils and Rock outcrop occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Cohagen soil is light brownish gray, calcareous fine sandy loam about 4 inches thick. The underlying material is light gray, calcareous fine sandy loam. Soft, calcareous sandstone and siltstone bedrock is at a depth of about 16 inches. In places the surface layer is loam. In some areas the soil is sandy throughout. In other areas it contains more silt and clay throughout.

The Rock outcrop generally is a vertical escarpment of light yellowish brown or light brownish gray, hard sandstone. It does not support vegetation.

Typically, the surface layer of the Cabba Variant soil is grayish brown, calcareous silty clay loam about 3 inches thick. The underlying material is calcareous silty clay loam. It is light yellowish brown in the upper part and multicolored in the lower part. White, hard sandstone is at a depth of about 18 inches. In places the depth to hard bedrock is 20 to 40 inches.

Included with the Cohagen and Cabba Variant soils and Rock outcrop in mapping are small areas of Amor, Daglum, Reeder, Rhoades, and Vebar soils. These included soils make up less than 25 percent of any one mapped area. They are on tableland above the Cabba Variant soil. Amor, Reeder, and Vebar soils are 20 to 40 inches deep over bedrock. Daglum and Rhoades soils have a sodium affected subsoil.

The content of organic matter and fertility are low in the Cabba Variant and Cohagen soils. Permeability is moderately rapid in the Cohagen soil and moderate in the Cabba Variant soil. Available water capacity is very low in both soils. Runoff is rapid. The shrink-swell potential is low in the Cohagen soil and moderate in the Cabba Variant soil.

All areas of the Cohagen and Cabba Variant soils support native grasses and are used for grazing. The Rock outcrop does not support grazable vegetation. Water erosion is a hazard. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying. Reestablishing vegetation is difficult.

This map unit is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the slope, the Rock outcrop, and the shallow depth to bedrock.

The Cohagen soil is in capability unit VIIe-4, and Cabba Variant soil is in capability unit VIIs-1; both soils are in Shallow range site and windbreak suitability group 10; the Rock outcrop is in capability unit VIIIs-1 and is not assigned to a range site or windbreak suitability group.

DcC—Delridge-Cabbart loams, 6 to 15 percent slopes. These well drained, moderately sloping and strongly sloping soils are on uplands. The moderately deep Delridge soil is on side slopes below the Cabbart soil. The shallow Cabbart soil is on ridges. Areas are irregular in shape and 10 to 100 acres in size. They are 55 to 65 percent Delridge soil and 25 to 30 percent Cabbart soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Delridge soil is brown loam about 5 inches thick. The subsoil is light gray, friable, calcareous loam about 10 inches thick. The underlying material is light brownish gray and light gray, calcareous loam. Weakly consolidated sandstone is at a depth of about 25 inches. In some areas the surface layer is darker.

Typically, the surface layer of the Cabbart soil is light yellowish brown, calcareous loam about 4 inches thick. The subsoil is pale yellow, very friable, calcareous loam about 7 inches thick. Weakly consolidated layers of sandstone, siltstone, and shale are at a depth of about 11 inches. In some areas the surface layer and subsoil are fine sandy loam.

Included with these soils in mapping are small areas of Bullock, Marmarth, Parchin, Rhame, and Twilight soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Bullock and Parchin soils are in small pits and depressions. They have a sodium affected subsoil. Marmarth, Rhame, and Twilight soils are lower on the landscape than the Delridge soil. Also, Marmarth soils have a darker surface layer, and Rhame and Twilight soils have more sand and less clay in the subsoil. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter and fertility are low in the Delridge and Cabbart soils. Permeability is moderate. Available water capacity is low in the Delridge soil and very low in the Cabbart soil. Runoff is medium or rapid on both soils. The shrink-swell potential is moderate in the Delridge soil and low in the Cabbart soil.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Water erosion is a hazard, however, unless an adequate plant cover is maintained. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because they are too steep and because the Cabbart soil is shallow. The less sloping areas of the Delridge soil, however, can be seeded to tame pasture plants or used for environmental plantings.

The capability unit is VIe-3, and the windbreak suitability group is 10; the Delridge soil is in Thin Upland range site, and the Cabbart soil is in Shallow range site.

Du—Dumps, mine. This map unit is in areas on uplands that formerly were or currently are surface mined. Areas are irregular in shape and 10 to more than 75 acres in size. Slopes range from nearly level on the bottom of the excavations to almost vertical on the sides and rims.

Overburden has been removed from nearly level areas of exposed bedrock. Mixed loamy overburden has been pushed into steep hillsides. Bedrock crops out in areas on the edges of the mines where deep cuts have been made. The bottom and sides support little or no vegetation during periods when the unit is mined.

Most mine dumps provide limited wildlife habitat. Abandoned areas can be restored to range if reclamation measures are applied. These measures include shaping the areas and using the overburden material as topsoil dressing. Applying fertilizer as needed helps to establish range or pasture plants.

The capability unit is VIIIs-1; no range site or windbreak suitability group is assigned.

Dw—Dune land. This map unit consists of areas on uplands where sandy material has been blown out of pits and redeposited as mounds. These areas do not support vegetation. In some areas, the sandy material has been removed and bedrock is exposed. Areas are irregular in shape and 10 to more than 130 acres in size.

Dune land can be restored to range if reclamation measures are applied. These measures include fencing, adding straw or manure, reseeding, and deferring grazing until a stand of grasses is established.

This map unit is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of a very severe hazard of wind erosion.

The capability unit is VIIIe-2; no range site or windbreak suitability group is assigned.

EaA—Eapa loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on fans and terraces. Areas are 10 to 200 acres in size and irregular in shape.

Typically, the surface layer is grayish brown loam about 4 inches thick. The subsoil is about 26 inches of grayish brown, light brownish gray, and light yellowish brown, very friable and friable, clay loam, sandy clay loam, and loam. It is calcareous in the lower part. The underlying material to a depth of 60 inches is gray, light brownish gray, and light gray, calcareous clay loam. In some areas soft bedrock is at a depth of 20 to 40 inches. In places the subsoil contains more sand.

Included with this soil in mapping are small areas of Archin, Attewan, Bullock, and Chinook soils. These soils make up less than 15 percent of any one mapped area. Archin and Bullock soils have a sodium affected subsoil. Archin soils are on small flats, and Bullock soils are in small pits and depressions. Attewan soils are 20 to 40 inches deep over sand and gravel. They are on terraces. Chinook soils contain more sand and less clay throughout than the Eapa soil. They are in positions on the landscape similar to those of the Eapa soil.

The content of organic matter is moderate in the Eapa soil, and fertility is medium. Tilth is good. Permeability is moderate. Available water capacity is high. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage and leaving crop residue on the surface.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIIc-1; Silty range site; windbreak suitability group 3.

EcA—Eapa-Archin complex, 0 to 3 percent slopes. These deep, well drained, nearly level soils are on fans and terraces. The Eapa soil is in slightly convex areas. The sodium affected Archin soil is on small flats and in depressions. Areas are irregular in shape and 10 to 100 acres in size. They are 40 to 50 percent Eapa soil and

30 to 35 percent Archin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Eapa soil is grayish brown loam about 4 inches thick. The subsoil is about 26 inches of grayish brown, light brownish gray, and light yellowish brown, friable and very friable clay loam, sandy clay loam, and loam. It is calcareous in the lower part. The underlying material to a depth of 60 inches is gray, light brownish gray, and light gray, calcareous clay loam. In places soft bedrock is at a depth of 20 to 40 inches. In some areas the subsoil contains more sand. In other areas gravelly material is below a depth of 30 inches.

Typically, the surface layer of the Archin soil is grayish brown fine sandy loam about 4 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, friable loam about 22 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous loam that has nests of gypsum crystals and other salts. In places the subsoil contains more clay.

Included with these soils in mapping are small areas of Bullock, Chinook, and Kremlin soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Bullock soils have a sodium affected subsoil. They are in small pits and depressions. Chinook soils contain more sand and less clay throughout than the Eapa soil. They are in positions on the landscape similar to those of the Eapa soil. The deep Kremlin soils are on fans and terraces. Slickspots have a dispersed surface and a high content of salts throughout. They are in small pits.

The content of organic matter is moderate in the Eapa soil and low in the Archin soil. Fertility is medium in the Eapa soil and low in the Archin soil. Tilth is good in the Eapa soil and poor in the Archin soil. Permeability is moderate in the Eapa soil and slow or very slow in the Archin soil. Available water capacity is high in the Eapa soil and moderate in the Archin soil. Runoff is slow on both soils. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the Archin soil is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Archin soil is a limitation. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Winter wheat, spring wheat, oats, and alfalfa are the main cultivated crops. Measures that conserve moisture and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system.

These soils are suited to windbreaks and environmental plantings, but the sodium affected subsoil in the Archin soil is a limitation. Windbreaks can be established on the Archin soil, but optimum growth is unlikely.

The Eapa soil is in capability unit IIIc-1, Silty range site, and windbreak suitability group 3; the Archin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9.

FaB—Farnuf loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on foot slopes and terraces. Areas are irregular in shape and 10 to more than 150 acres in size.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. The subsoil is grayish brown, friable and firm clay loam about 30 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. In places the dark colors extend to a depth of more than 16 inches. In some areas the depth to soft bedrock is 20 to 40 inches.

Included with this soil in mapping are small areas of Cabba, Daglum, Lantry, Rhoades, and Savage soils. These soils make up less than 15 percent of any one mapped area. The shallow Cabba and moderately deep Lantry soils are on low ridges and knolls. The sodium affected Daglum and Rhoades soils are in small depressions. Savage soils are on terraces. They have more clay in the subsoil than the Farnuf soil.

The content of organic matter is moderate in the Farnuf soil, and fertility is medium. Tilth is good. Permeability is moderate. Available water capacity is high. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, alfalfa, and crested wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and farming on the contour.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIe-1; Silty range site; windbreak suitability group 3.

FtE—Fleak-Trey-Rock outcrop complex, 15 to 50 percent slopes. This map unit occurs as areas of well drained, moderately steep to very steep soils intermingled with areas where bedrock crops out. The unit is on uplands. The shallow Fleak soil is on ridges. The moderately deep Trey soil is on side slopes. The Rock outcrop is intermingled throughout areas of the Fleak soil. Areas are irregular in shape and 10 to more than 100 acres in size. They are about 30 to 40 percent Fleak soil, 25 to 35 percent Trey soil, and 15 to 25 percent Rock outcrop. The two soils and Rock outcrop occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Fleak soil is grayish brown, calcareous loamy fine sand about 5 inches thick. The underlying material is grayish brown and light brownish gray, calcareous loamy fine sand. Yellowish brown, weakly consolidated sandstone is at a depth of about 16 inches. In places the soil is calcareous throughout. In some areas it contains less sand throughout.

Typically, the surface layer of the Trey soil is dark grayish brown loamy fine sand about 4 inches thick. The next 26 inches is grayish brown fine sand. Soft sandstone is at a depth of about 30 inches. In places the depth to bedrock is more than 40 inches.

The Rock outcrop is hard sandstone. In places soft siltstone and clayey shale are exposed.

Included with the Fleak and Trey soils and Rock outcrop in mapping are small areas of Bullock, Parchin, Rhame, and Twilight soils. These included soils make up less than 25 percent of any one mapped area. Bullock and Parchin soils are in small pits and depressions. They have a sodium affected subsoil. Rhame and Twilight soils are in positions on the landscape similar to those of the Trey soil. They have less sand throughout than the Trey soil.

The content of organic matter and fertility are low in the Fleak and Trey soils. Permeability is rapid. Available water capacity is very low in the Fleak soil and low in the Trey soil. Runoff is medium on both soils.

All areas of the Fleak and Trey soils support native grasses and are used for grazing. Water erosion and wind erosion are hazards unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This map unit is too steep, too shallow, and too sandy for tame pasture and hay and for windbreaks and environmental plantings.

The Fleak and Trey soils are in capability unit VIIe-3 and windbreak suitability group 10; the Fleak soil is in Shallow range site, and the Trey soil is in Sands range site; the Rock outcrop is in capability unit VIIIs-1 and is not assigned to a range site or windbreak suitability group.

GdA—Gerdrum silt loam, 0 to 4 percent slopes. This deep, well drained, nearly level and very gently sloping soil is on uplands and terraces. Areas are irregular in shape and 10 to more than 125 acres in size.

Typically, the surface layer is light brownish gray silt loam about 2 inches thick. The subsoil is grayish brown and light brownish gray silty clay about 34 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. It has gypsum and other salts throughout. In some areas visible salts are throughout the subsoil.

Included with this soil in mapping are small areas of Eapa and Savage soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Eapa and Savage soils do not have a sodium affected subsoil. They are in positions on the landscape similar to those of the Gerdrum soil. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter and fertility are low in the Gerdrum soil. Tilth is poor. The sodium affected subsoil restricts the penetration of plant roots. Permeability is very slow. Available water capacity is low or moderate. Runoff is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. The sodium affected subsoil limits productivity. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth.

This soil is suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil is a limitation. Intermediate wheatgrass and crested wheatgrass are examples of suitable pasture plants. Winter wheat, spring wheat, and oats are the main cultivated crops. Measures that conserve moisture and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Chiseling or subsoiling increases the rate of water intake and improves tilth.

This soil is poorly suited to windbreaks and environmental plantings. The dense claypan subsoil severely limits root penetration. Optimum growth, survival, and vigor are unlikely.

The capability unit is IVs-2; Claypan range site; windbreak suitability group 9.

Ge—Glendive fine sandy loam. This deep, well drained, nearly level soil is on flood plains and terraces. It is subject to rare flooding, which lasts for brief periods. Areas are irregular in shape and 10 to more than 100 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is light brownish gray, olive, and pale

olive, calcareous, stratified fine sandy loam, loamy sand, and loam. In places the soil is noncalcareous. In some areas it contains more silt and less sand. In other areas it contains more sand and less clay.

Included with this soil in mapping are small areas of Archin, Bullock, and Lallie soils. These soils make up less than 15 percent of any one mapped area. The sodium affected Archin and Bullock soils are in small pits and depressions. The poorly drained Lallie soils are lower on the flood plains than the Glendive soil. Also, they contain more clay throughout.

The content of organic matter and fertility are low in Glendive soil. Tilth is fair. Permeability is moderately rapid. Available water capacity is low or moderate.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed.

This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, crested wheatgrass, and intermediate wheatgrass are examples of suitable pasture plants. Spring wheat, alfalfa, oats, and winter wheat are the main cultivated crops. Measures that control wind erosion, conserve moisture, and improve fertility are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and stripcropping.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Preparing the site for planting in the spring helps to control wind erosion.

The capability unit is IIIe-4; Loamy Terrace range site; windbreak suitability group 1.

GhB—Glendive-Archin fine sandy loams, 2 to 6 percent slopes. These deep, well drained, gently sloping soils are on terraces. They are subject to rare flooding, which lasts for brief periods. The Glendive soil is in slightly convex areas. The sodium affected Archin soil is in depressions. Areas are irregular in shape and 10 to 75 acres in size. They are 45 to 55 percent Glendive soil and 20 to 30 percent Archin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Glendive soil is grayish brown fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is light brownish gray, olive, and pale olive, calcareous, stratified fine sandy loam, loam, and loamy sand. In some areas it contains more silt and clay.

Typically, the surface layer of the Archin soil is grayish brown fine sandy loam about 4 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, friable loam about 22 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous loam that has nests of gypsum crystals and other salts. In some areas the subsoil contains more clay.

Included with these soils in mapping are small areas of Assinniboine, Bullock, Chinook, Eapa, Kremlin, Trey, and Zeona soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Assinniboine, Chinook, Eapa, and Kremlin soils are slightly higher on the landscape than the Glendive soil. Also, they have a darker surface layer and do not have a sodium affected subsoil. Bullock soils have a surface layer that is thinner than that of the Archin soil. They are in small pits. The sandy Trey and Zeona soils are higher on the landscape than the Glendive soil. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter and fertility are low in the Glendive and Archin soils. Tilth is fair in the Glendive soil and poor in the Archin soil. Permeability is moderately rapid in the Glendive soil and slow or very slow in the Archin soil. Available water capacity is low or moderate in the Glendive soil and moderate in the Archin soil. Runoff is slow on both soils. The shrink-swell potential is low in the Glendive soil and moderate in the Archin soil.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the range is overgrazed.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Archin soil is a limitation. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that control wind erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface, minimizing tillage, and stripcropping. Chiseling or subsoiling improves tilth and increases the rate of water intake in areas of the Archin soil.

These soils are suited to windbreaks and environmental plantings, but the sodium affected subsoil in the Archin soil is a limitation. Windbreaks can be established on the Archin soil, but optimum growth is unlikely. Preparing the site for planting in the spring helps to control wind erosion.

The Glendive soil is in capability unit IVe-6, Sandy range site, and windbreak suitability group 5; the Archin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9.

GkA—Grail silt loam, 0 to 3 percent slopes. This deep, moderately well drained, nearly level soil is in swales and on broad flats in the uplands. It is frequently flooded for very brief periods. Areas are long and narrow and 10 to 85 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is clay loam about 50 inches thick. The upper part is dark grayish brown and friable, and the lower part is grayish brown, light brownish gray, and light yellowish brown, firm, and calcareous. The underlying material to a depth of 60 inches is light yellowish brown, calcareous silty clay loam. In places the subsoil contains less clay. In some areas soft bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Amor, Daglum, Heil, Reeder, and Rhoades soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The moderately deep Amor and Reeder soils are higher on the landscape than the Grail soil. The sodium affected Daglum and Rhoades soils are in small pits and depressions. The poorly drained Heil soils are in depressions. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter and fertility are high in the Grail soil. Tilth is good. Permeability is moderately slow. Available water capacity is high. A seasonal high water table is at a depth of 3.0 to 6.0 feet. Runoff is slow. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that conserve moisture during dry periods are the main management needs. Examples are minimizing tillage and leaving crop residue on the surface. In some years fieldwork is delayed because the soil receives runoff from the adjacent soils. In most years, however, the additional moisture is beneficial.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Those that require an abundant supply of moisture grow especially well.

The capability unit is IIc-3; Loamy Overflow range site; windbreak suitability group 1.

GrA—Grail-Daglum complex, 0 to 3 percent slopes. These deep, well drained, nearly level soils are in swales on uplands. The Grail soil is on the low parts of the landscape. It is frequently flooded. The Daglum soil is on small flats and in depressions. Areas are long and narrow and 10 to 75 acres in size. They are 50 to 60 percent Grail soil and 25 to 35 percent Daglum soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Grail soil is dark grayish brown silt loam about 6 inches thick. The subsoil is clay loam about 50 inches thick. The upper part is dark grayish brown and friable, and the lower part is grayish brown, light brownish gray, and light yellowish brown, firm, and calcareous. The underlying material to a depth of 60 inches is light yellowish brown, calcareous silty clay loam. In places the subsoil contains less clay.

Typically, the surface layer of the Daglum soil is grayish brown loam about 6 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, firm clay loam about 30 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is olive gray, calcareous clay loam that has nests of gypsum crystals and other salts. In some areas soft bedrock is at a depth of 20 to 40 inches.

Included with these soils in mapping are small areas of Heil and Rhoades soils. These included soils make up less than 15 percent of any one mapped area. The poorly drained Heil soils are in depressions. Rhoades soils are in small pits. Their surface layer is not so thick as that of the Daglum soil.

The content of organic matter is high in the Grail soil and moderate in the Daglum soil. Fertility is high in the Grail soil and low in the Daglum soil. Tilth is good in the Grail soil and poor in the Daglum soil. Permeability is moderately slow in the Grail soil and very slow in the Daglum soil. Available water capacity is high in the Grail soil and moderate in the Daglum soil. The Grail soil has a seasonal high water table at a depth of 3.0 to 6.0 feet. The shrink-swell potential is high in both soils.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Daglum soil is a limitation. Alfalfa, crested wheatgrass, and intermediate wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that conserve moisture and improve tilth in the Daglum soil are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, leaving crop residue on the surface, and minimizing tillage. Chiseling or subsoiling increases the rate of water intake and improves tilth.

These soils are suited to windbreaks and environmental plantings, but the sodium affected subsoil in the Daglum soil is a limitation. Windbreaks can be established on the Daglum soil, but optimum growth is unlikely.

The Grail soil is in capability unit IIc-3, Loamy Overflow range site, and windbreak suitability group 1; the Daglum soil is in capability unit IVs-2, Claypan range site, and windbreak suitability group 9.

Ha—Hanly fine sandy loam. This deep, somewhat excessively drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are irregular in shape and 10 to 50 acres in size.

Typically, the surface layer is grayish brown, calcareous fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light grayish brown, calcareous loamy fine sand, sand, and fine sand. In some areas the soil contains more silt and less sand.

Included with this soil in mapping are small areas of Archin, Bullock, Dogiecreek, Havre, Harlem, and Lallie soils. These soils make up less than 15 percent of any one mapped area. The sodium affected Archin and Bullock soils are in small depressions. The poorly drained Dogiecreek soils are slightly lower on the flood plains than the Hanley soil. The well drained Havre and Harlem soils are higher on the flood plains than the Hanly soil. Also, they contain more clay and less sand throughout. The poorly drained Lallie soils are in old stream channels on the flood plains.

The content of organic matter and fertility are low in the Hanley soil. Tilth is poor. Permeability is rapid. Available water capacity is low or moderate. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Sand blowouts can form in overgrazed areas. Maintaining an adequate plant cover helps to control wind erosion. Reseeding is needed on some sites.

This soil generally is unsuited to cultivated crops and to tame pasture and hay. Erosion is a severe hazard, and the low fertility and low available water capacity are limitations.

This soil is suited to environmental plantings, but only evergreen trees and shrubs can be successfully established. Planting the trees and shrubs directly in sod helps to control erosion.

The capability unit is VIe-8; Sandy range site; windbreak suitability group 7.

Hb—Hanly loamy fine sand. This deep, well drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are long and narrow or irregular in shape. They are 10 to more than 100 acres in size.

Typically, the surface layer is grayish brown, calcareous loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray and light olive gray, calcareous, stratified loamy fine sand and sand.

Included with this soil in mapping are small areas of Dogiecreek, Glendive, Havre, and Korchea soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The poorly drained Dogiecreek soils are lower on the flood plains than the Hanly soil. Glendive, Havre, and Korchea soils are slightly higher on the flood plains than the Hanly soil. Also, they contain more silt and clay throughout. Slickspots are on small flats. They have a dispersed surface and a high content of salts throughout. Also included, in areas adjacent to some of the major drainageways, are recently flooded soils that contain more gravel throughout than the Hanly soil and support a thinner stand of grasses.

The content of organic matter and fertility are low in the Hanly soil. Tilth is poor. Permeability is moderate. Available water capacity is low. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Sand blowouts can form in overgrazed areas. Maintaining an adequate plant cover helps to control wind erosion. Reseeding is needed in some areas.

This soil generally is unsuited to cultivated crops and to tame pasture and hay. Erosion is a severe hazard, and the low fertility and low available water capacity are limitations.

This soil is suited to environmental plantings, but only evergreen trees and shrubs can be successfully established. Planting the trees and shrubs directly in sod helps to control erosion.

The capability unit is VIe-8; Sands range site; windbreak suitability group 7.

Hd—Hanly-Dogiecreek fine sandy loams. These deep, nearly level soils are on flood plains (fig. 7). The somewhat excessively drained Hanly soil is on the high parts of the flood plains. It is subject to rare flooding. The poorly drained Dogiecreek soil is on the low parts of the flood plains, generally near streams. It is occasionally flooded. Areas are long and narrow and 10 to more than 100 areas in size. They are 40 to 50 percent Hanly soil and 35 to 45 percent Dogiecreek soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Hanly soil is grayish brown, calcareous fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light grayish brown, calcareous loamy fine sand and sand. In some areas the soil is gravelly loam throughout.

Typically, the surface layer of the Dogiecreek soil is light brownish gray fine sandy loam about 3 inches thick. The underlying material to a depth of 60 inches is grayish brown, olive gray, light olive gray, and light gray, calcareous, stratified loam, fine sandy loam, and loamy fine sand. In the lower part it is mottled and has nests of gypsum and other salts. In places the soil contains more clay throughout.

Included with these soils in mapping are small areas of Archin, Bullock, Glendive, Havre, and Korchea soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. The sodium affected Archin and Bullock soils are slightly higher on the flood plains than the Hanly soil. Glendive, Havre, and Korchea soils are slightly higher on the flood plains than the

Figure 7.—An area of Hanly-Dogiecreek fine sandy loams. The Hanly soil is on the slight rises. The Dogiecreek soil is in the light colored, low areas.

Dogiecreek soil. Also, they have a lower content of salts throughout. Slickspots are on small flats. They have a dispersed surface and a high content of salts throughout.

The content of organic matter and fertility are low in the Hanly and Dogiecreek soils. Tilth is poor. The Dogiecreek soil has a high content of salts throughout. Permeability is rapid in the Hanly soil and moderate in the Dogiecreek soil. Available water capacity is low or moderate in the Hanly soil and moderate in the Dogiecreek soil. The Dogiecreek soil has a seasonal high water table within a depth of 3 feet. Runoff is slow on both soils. The shrink-swell potential is low.

Most of the acreage supports native grasses and is used for grazing. Sand blowouts can form in overgrazed areas of the Hanly soil. An excess of salts and compaction are problems in areas of the Dogiecreek soil. Maintaining an adequate plant cover helps to control wind erosion. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth in areas of the Dogiecreek soil. Many areas of this soil are potential sites for excavated ponds.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. A severe hazard of wind erosion on the Hanly soil and the high content of salts in the Dogiecreek soil are problems.

This map unit is poorly suited to windbreaks and environmental plantings. Only evergreen trees and shrubs can be successfully established on the Hanly soil. No trees or shrubs grow well on the Dogiecreek soil because of the high content of salts.

The Hanly soil is in capability unit VIe-8, Sands range site, and windbreak suitability group 7; the Dogiecreek soil is in capability unit VIIs-9, Saline Lowland range site, and windbreak suitability group 10.

He—Hanly-Slickspots complex. This map unit occurs as areas of a deep, somewhat excessively drained, nearly level Hanly soil closely intermingled with Slickspots. The unit is on flood plains. The Hanly soil is on the higher parts of the flood plains. It is subject to rare flooding. The Slickspots are in depressions and old stream meander channels. Areas are irregular in shape and 10 to 50 acres in size. They are 60 to 75 percent Hanly soil and 15 to 30 percent Slickspots. The Hanly soil and Slickspots occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Hanly soil is grayish brown, calcareous loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray and light olive gray, calcareous, stratified loamy fine sand and sand.

The Slickspots occur as slightly depressional, barren areas that have a puddled or slick surface. Visible accumulations of salts are at or near the surface. The soil material to a depth of 60 inches is sandy clay loam.

Included with the Hanly soil and Slickspots in mapping are small areas of Archin, Bullock, Glendive, and Havre soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected Archin and Bullock soils are slightly higher on the flood plains than the Hanly soil. Glendive and Havre soils are slightly lower on the flood plains than the Hanly soil. Also, they contain less sand and more silt and clay throughout.

The content of organic matter and fertility are low in the Hanly soil. Tilth is poor. Permeability is rapid. Available water capacity is low. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Sand blowouts can form in overgrazed areas. Maintaining an adequate plant cover helps to control wind erosion. Reseeding is needed in some areas. Slickspots generally support little or no vegetation, but they do support a sparse stand of weeds and pricklypear during wet periods.

This map unit generally is unsuited to cultivated crops and to tame pasture and hay. A severe hazard of erosion on the Hanly soil and the salts in the Slickspots are problems.

This map unit is poorly suited to windbreaks and environmental plantings. Only evergreen trees and shrubs can successfully be established on the Hanly soil. No trees or shrubs grow well on the Slickspots.

The Hanly soil is in capability unit VIe-8, Sands range site, and windbreak suitability group 7; the Slickspots are in capability unit VIIIs-3 and are not assigned to a range site or windbreak suitability group.

Hf—Harlem silty clay, channeled. This deep, well drained, nearly level soil is on flood plains dissected by narrow channels and partly filled old stream meanders. It is occasionally flooded for brief periods. Areas are long and narrow and 5 to 100 acres in size.

Typically, the surface layer is grayish brown silty clay about 9 inches thick. The underlying material to a depth of 60 inches is grayish brown, olive gray, gray, and olive, calcareous, stratified silty clay loam, silty clay, and clay. In the lower part it has thin strata of silt loam, loam, and clay loam and has gypsum crystals and other salts.

Included with this soil in mapping are small areas of Archin, Bullock, Gerdrum, Glendive, Kyle, Lallie, Sage, and Twotop soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The sodium affected Archin, Bullock, and Gerdrum soils are on small terraces, generally above the Harlem soil. Glendive soils contain more sand and less clay throughout than the Harlem soil. Also, they are slightly higher on the flood plains. Kyle and Twotop soils are not stratified. They are on foot slopes near the edge of the mapped areas. The poorly drained Lallie soil is in old stream meanders. Sage soils contain a high content of salts throughout. They are in positions on the landscape similar to those of the Harlem soil. Slickspots are on small flats. They have a dispersed surface and a high content of salts throughout.

The content of organic matter and fertility are low in the Harlem soil. Tilth is fair. Permeability is slow. Available water capacity is moderate or high. Runoff is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for hay or grazing. Some areas near stream channels support deciduous trees and shrubs, which protect wildlife and livestock in winter. Although the soil is occasionally flooded, the additional water is beneficial. Ponds in some areas of the channels provide temporary watering sites for livestock and wildlife.

This soil generally is unsuited to cultivated crops because it is dissected into many small tracts and is subject to flooding. It is suited to tame pasture and hay, but harvesting hay is difficult because of the meandering channels. Bromegrass, intermediate wheatgrass, and alfalfa are examples of suitable pasture plants.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Because of the meandering channels, trees generally cannot be planted by machine. They can be planted by hand.

The capability unit is VIw-1; Clayey Overflow range site; windbreak suitability group 1.

Hg—Havre loam. This deep, well drained, nearly level soil is on flood plains and low terraces. It is subject to rare flooding, which lasts for brief periods. Areas generally are irregular in shape and 10 to 75 acres in size.

Typically, the surface layer is grayish brown loam about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous, stratified loam, clay loam, and fine sandy loam. In some areas the soil contains more sand

throughout. In other areas it contains more clay throughout.

Included with this soil in mapping are small areas of Archin, Bullock, Hanly, Kremlin, and Lallie soils. These soils make up less than 15 percent of any one mapped area. The sodium affected Archin and Bullock soils are in small depressions and pits. The somewhat excessively drained Hanly soils are slightly lower on the flood plains than the Havre soil. Kremlin soils have a dark surface layer. They are adjacent to the uplands. The poorly drained Lallie soils are in old stream channels on the flood plains.

The content of organic matter and fertility are low in the Havre soil. Tilth is good. Permeability is moderate. Available water capacity is moderate or high. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Some areas support a sparse stand of deciduous trees and shrubs, which help to protect the livestock.

This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, alfalfa, and oats are the main cultivated crops. Measures that control erosion, improve fertility, and conserve moisture are the main management needs. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

The capability unit is IIIc-2; Loamy Terrace range site; windbreak suitability group 1.

Hh—Havre-Harlem complex. These deep, nearly level, well drained soils are on flood plains. They are subject to rare flooding. The loamy Havre soil is on the high parts of the flood plains, and the clayey Harlem soil is on the low parts. Areas are irregular in shape and 10 to 100 acres in size. They are 45 to 50 percent Havre soil and 20 to 35 percent Harlem soil. The two soils occur in areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Havre soil is grayish brown loam about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous, stratified loam, clay loam, and fine sandy loam. In places the soil contains more sand throughout.

Typically, the surface layer of the Harlem soil is grayish brown silty clay about 9 inches thick. The underlying material to a depth of 60 inches is grayish brown, gray, olive gray, and olive, calcareous, stratified silty clay, clay, and silty clay loam. In the lower part it has thin strata of silt loam, loam, and clay loam and has gypsum crystals and other salts.

Included with these soils in mapping are small areas of Archin, Bullock, Hanly, Lallie, and Sage soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected Archin and Bullock soils are adjacent to the uplands. The sandy Hanly soils are adjacent to stream channels. The poorly drained Lallie soils are in partially filled stream meanders. Sage soils have a high content of salts throughout. They are in positions on the flood plains similar to those of the Havre and Harlem soils.

The content of organic matter and fertility are low in the Harlem and Havre soils. Tilth is good in the Havre soil and fair in the Harlem soil. Permeability is moderate in the Havre soil and slow in the Harlem soil. Available water capacity is moderate or high in both soils. Runoff is slow. The shrink-swell potential is moderate in the Havre soil and high in the Harlem soil.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range, but the Harlem soil is subject to compaction if the range is grazed when wet. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth.

These soils are suited to cultivated crops and to tame pasture and hay. Alfalfa, intermediate wheatgrass, crested wheatgrass, and smooth bromegrass are suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that conserve moisture and improve fertility and tilth are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system.

These soils are suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

The capability unit is IIIc-2, and the windbreak suitability group is 1; the Havre soil is in Loamy Terrace range site, and the Harlem soil is in Clayey Overflow range site.

Hk—Heil silt loam. This deep, poorly drained, level soil is in depressions on uplands. It is ponded during wet periods. Areas are 5 to 50 acres in size and are circular or oval.

Typically, the surface layer is gray, mottled silt loam about 1 inch thick. The subsoil is gray silty clay about 34 inches thick. It has gypsum crystals and other salts in the lower part. The underlying material to a depth of 60 inches is olive gray and light olive gray, mottled, calcareous clay loam.

Included with this soil in mapping are small areas of Daglum, Grail, and Rhoades soils and Slickspots. These inclusions make up less than 15 percent of any one

mapped area. The well drained Daglum and Rhoades soils are higher on the landscape than the Heil soil. The moderately well drained Grail soils are in swales and are slightly higher on the landscape than the Heil soil. Slickspots are near the edges of the depressions. They have a dispersed surface and a high content of salts throughout. They generally support little or no vegetation.

The content of organic matter is moderate in the Heil soil, and fertility is low. Tilth is poor. Permeability is very slow. Available water capacity is moderate. A seasonal high water table is within a depth of 1 foot in the spring. As much as 1 foot of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Compaction and ponding are problems. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the seasonal wetness. Artificial drainage generally is not feasible because suitable outlets are not available. Western wheatgrass is the best species for planting if cultivated areas are seeded.

The capability unit is VIs-1; Closed Depression range site; windbreak suitability group 10.

HsB—Hisle-Slickspots complex, 0 to 6 percent slopes. This map unit occurs as areas of a moderately deep, well drained, nearly level and gently sloping Hisle soil intermingled with Slickspots. The unit is on uplands. The Hisle soil is on the high parts of the landscape. The Slickspots are in slight depressions. Areas are irregular in shape and 10 to 100 acres in size. They are 55 to 65 percent Hisle soil and 20 to 30 percent Slickspots. The Hisle soil and Slickspots occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Hisle soil is gray silt loam about 1 inch thick. The subsoil is grayish brown and light olive gray, very firm clay about 21 inches thick. It has gypsum crystals in the lower part. The underlying material is olive gray clay. It has gypsum crystals and other salts throughout. Gray shale is at a depth of about 34 inches. In some areas the depth to shale is more than 40 inches.

The Slickspots occur as slightly depressional, barren areas that have a puddled or slick surface. Accumulations of salts are at or near the surface. The soil material to a depth of about 34 inches is massive clay. Below this is shale.

Included with the Hisle soil and Slickspots in mapping are small areas of Lismas, Sage, Swanboy, Twotop, and Winler soils. These included soils make up less than 25 percent of any one mapped area. The shallow Lismas soils are on ridges. The poorly drained Sage soils are in swales and on narrow flood plains below the Hisle soil. The deep Swanboy and Twotop soils do not have a natric horizon. They are on fans. Winler soils do not have a sodium affected subsoil. They are slightly higher on the landscape than the Hisle soil.

The content of organic matter and fertility are low in the Hisle soil. Tilth is poor. The sodium affected subsoil restricts the penetration of plant roots. Permeability is very slow. Available water capacity is very low or low. Runoff is slow or medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Slickspots generally support little or no vegetation, but they do support a sparse stand of weeds and pricklypear during wet periods.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The sodium affected subsoil in the Hisle soil and the salts in the Slickspots are limitations.

The Hisle soil is in capability unit VIs-3, Thin Claypan range site, and windbreak suitability group 10; the Slickspots are in capability unit VIIIs-3 and are not assigned to a range site or windbreak suitability group.

KcF—Kirby-Cabbart-Rock outcrop complex, 15 to 60 percent slopes. This map unit occurs as areas of well drained, moderately steep to very steep soils intermingled with areas where bedrock crops out. The scattered stones and boulders are on the surface in some areas. The unit is on uplands. The deep Kirby soil is on the crest of narrow ridges. The shallow Cabbart soil is on the upper side slopes. The Rock outcrop is intermingled throughout areas of the Cabbart soil. Areas are irregular in shape and 5 to 50 acres in size. They are 30 to 35 percent Kirby soil, 20 to 30 percent Cabbart soil, and 15 to 25 percent Rock outcrop. The two soils and the Rock outcrop occur as areas so small or so closely intermingled that mapping them separately is not practical.

Typically, the surface layer of the Kirby soil is brown, calcareous channery sandy loam about 7 inches thick. The upper part of the underlying material is pink, calcareous extremely channery sandy loam. The lower part to a depth of 60 inches is fragments of porcellanite. In some areas the surface layer is channery loam.

Typically, the surface layer of the Cabbart soil is light yellowish brown, calcareous loam about 4 inches thick. The subsoil is pale yellow, very friable, calcareous loam about 7 inches thick. Weakly consolidated layers of sandstone, siltstone, and shale are at a depth of about 11 inches.

The Rock outcrop is pink, hard, fractured porcellanite and soft, multicolored sandstone, siltstone, and shale.

Included with these soils in mapping are small areas of Bullock, Marmarth, Parchin, Rhame, and Twilight soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected Bullock and Parchin soils are in small pits and depressions. The moderately deep Marmarth, Rhame, and Twilight soils are on the smooth parts of the landscape, generally below the Kirby and Cabbart soils.

The content of organic matter and fertility are low in the Kirby and Cabbart soils. Permeability is moderate in the Cabbart soil and rapid in the Kirby soil. Available water capacity is very low in both soils. Runoff is rapid.

All areas of the Kirby and Cabbart soils support native grasses and are used for grazing. Water erosion is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The Rock outcrop is an additional limitation.

The Kirby soil is in capability unit VIIs-6 and Very Shallow range site; the Cabbart soil is in capability unit VIIe-4 and Shallow range site; both soils are in windbreak suitability group 10; the Rock outcrop is in capability unit VIIIs-1 and is not assigned to a range site or windbreak suitability group.

Ke—Korchea loam. This deep, well drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are long and narrow and 10 to more than 75 acres in size.

Typically, the surface layer is dark grayish brown, stratified loam about 4 inches thick. The subsurface layer is about 11 inches of grayish brown, calcareous, stratified silt loam and loam. The underlying material to a depth of 60 inches is light brownish gray and grayish brown, calcareous, stratified loam, fine sandy loam, and clay loam. In places thin strata of sand and gravel are below a depth of 40 inches. In some areas the surface soil is not so dark.

Included with this soil in mapping are small areas of the sodium affected Archin, Bullock, and Rhoades soils. These soils make up less than 15 percent of any one mapped area. They are adjacent to the uplands.

The content of organic matter and fertility are high in the Korchea soil. Tilth is good. Permeability is moderate. Available water capacity is high. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Proper grazing rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are examples of suitable pasture plants. Alfalfa, spring wheat, winter wheat, oats, and barley are the main cultivated crops. Measures that conserve moisture during dry periods are the main management needs in cultivated areas. Examples are minimizing tillage and leaving crop residue on the surface.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well.

The capability unit is IIc-1; Loamy Overflow range site; windbreak suitability group 1.

Kg—Korchea loam, channeled. This deep, well drained, nearly level soil is on flood plains dissected by narrow channels and partly filled old stream meanders. It is occasionally flooded for brief periods. Areas are long and narrow and 10 to 20 acres in size.

Typically, the surface layer is dark grayish brown, stratified loam about 4 inches thick. The subsurface layer is about 11 inches of grayish brown, calcareous, stratified silt loam and loam. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous, stratified loam, fine sandy loam, and clay loam. In places the surface soil is not so dark.

Included with this soil in mapping are small areas of Archin, Bullock, Glendive, Hanly, Harlem, and Lallie soils. These soils make up less than 25 percent of any one mapped area. The sodium affected Archin and Bullock soils are adjacent to the uplands. Glendive soils are in positions on the landscape similar to those of the Korchea soil. They contain more sand and less clay throughout than the Korchea soil. The sandy Hanly soils and the clayey Harlem soils are slightly lower on the flood plains than the Korchea soil. The poorly drained Lallie soils are in partially filled old stream meanders.

The content of organic matter and fertility are high in the Korchea soil. Tilth is good. Permeability is moderate. Available water capacity is high. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Some areas near the stream channels support deciduous trees and shrubs, which protect wildlife and livestock. Although the soil is occasionally flooded, the additional moisture is beneficial. Ponds in some areas of the channels provide temporary watering sites for livestock and wildlife.

This soil generally is unsuited to cultivated crops because it is dissected into many small tracts and is occasionally flooded. It is suited to tame pasture and hay, but harvesting hay is difficult because of the meandering channels. Alfalfa, intermediate wheatgrass, crested wheatgrass, and smooth bromegrass are examples of suitable pasture plants.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Because of the meandering channels, trees generally cannot be planted by machine. They can be planted by hand.

The capability unit is VIw-1; Loamy Overflow range site; windbreak suitability group 1.

Km—Korchea-Archin complex. These deep, well drained, nearly level soils are on low terraces and flood plains. They are subject to rare flooding. The Archin soil is sodium affected. Areas generally are irregular in shape and 10 to 125 acres in size. They are 50 to 60 percent Korchea soil and 25 to 35 percent Archin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Korchea soil is dark grayish brown, stratified loam about 4 inches thick. The subsurface layer is about 11 inches of grayish brown, calcareous, stratified loam and silt loam. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous, stratified loam, fine sandy loam, and clay loam. In places thin strata of sand and gravel are below a depth of 40 inches. In some areas the surface soil is not so dark.

Typically, the surface layer of the Archin soil is grayish brown fine sandy loam about 4 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, friable loam about 22 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous loam that has nests of gypsum and other salts. In places the subsoil contains more clay.

Included with these soils in mapping are small areas of Bullock, Farnuf, Grail, Rhoades, and Shambo soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Bullock and Rhoades soils are in small pits and depressions. Their surface layer is thinner than that of the Archin soil. Farnuf and Shambo soils are slightly higher on the landscape than the Korchea soil. They are not stratified. Grail soils are in swales. They contain more clay in the subsoil than the Korchea soil. Slickspots are in small pits. They have a puddled or slick surface and a high content of salts throughout. They generally do not support vegetation.

The content of organic matter and fertility are high in the Korchea soil and low in the Archin soil. Tilth is good in the Korchea soil and poor in the Archin soil. Permeability is moderate in the Korchea soil and slow or very slow in the Archin soil. Available water capacity is high in the Korchea soil and moderate in the Archin soil. Runoff is slow on both soils. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the Archin soil is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Archin soil is a limitation. Alfalfa, intermediate wheatgrass, and crested wheatgrass are examples of suitable tame pasture plants. Alfalfa, winter wheat, spring wheat, and oats are the main cultivated crops. Measures that conserve moisture and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage, including grasses and legumes in the cropping system, and leaving crop residue on the surface.

These soils are suited to windbreaks and environmental plantings, but the sodium affected subsoil in the Archin soil is a limitation. Windbreaks can be established on the Archin soil, but optimum growth is unlikely.

The Korchea soil is in capability unit IIc-1, Loamy Overflow range site, and windbreak suitability group 1; the Archin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9.

KoA—Kremlin loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on terraces and fans. Areas are irregular in shape and 10 to about 100 acres in size.

Typically, the surface layer is grayish brown loam about 6 inches thick. The subsoil is dark grayish brown, light yellowish brown, and light brownish gray, friable and firm loam about 32 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light olive gray, calcareous, stratified loam. In places the surface layer is calcareous and is not so dark. In some areas the subsoil contains more clay.

Included with this soil in mapping are small areas of Archin, Bullock, and Parshall soils. These soils make up less than 15 percent of any one mapped area. The sodium affected Archin and Bullock soils are in small depressions. Parshall soils contain more sand and less clay in the subsoil than the Kremlin soil. They are in swales.

The content of organic matter is moderate in the Kremlin soil, and fertility is medium. Tilth is good. Permeability is moderate. Available water capacity is high. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, crested

wheatgrass, and alfalfa are examples of suitable pasture plants. Winter wheat, spring wheat, and alfalfa are the main cultivated crops. Measures that conserve moisture are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, minimizing tillage, and leaving crop residue on the surface.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIIc-1; Silty range site; windbreak suitability group 3.

KrA—Kremlin-Archin complex, 0 to 3 percent slopes. These deep, well drained, nearly level soils are on fans and terraces. The Kremlin soil is on the high parts of the landscape. The sodium affected Archin soil is on small flats and is slightly lower on the landscape than the Kremlin soil. Areas are 10 to 100 acres in size and irregular in shape. They are 50 to 60 percent Kremlin soil and 20 to 30 percent Archin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Kremlin soil is grayish brown loam about 6 inches thick. The subsoil is dark grayish brown, light yellowish brown, and light brownish gray, friable and firm loam about 32 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light olive gray, stratified, calcareous loam. In some areas the surface layer is not so dark and is calcareous. In other areas the subsoil contains more clay.

Typically, the surface layer of the Archin soil is grayish brown fine sandy loam about 4 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, friable loam about 22 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous loam that has nests of gypsum crystals and other salts. In some areas the subsoil contains more clay.

Included with these soils in mapping are small areas of Attewan, Bullock, and Parshall soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Attewan soils are 20 to 40 inches deep to gravelly material. They are slightly higher on the landscape than the Kremlin soil. Bullock soils have a thin surface layer. They are in small pits. Parshall soils are dark to a depth of more than 16 inches. They do not have a sodium affected subsoil. They are in swales. Slickspots have a dispersed surface and a high content of salts throughout. They generally do not support vegetation. They are in small pits.

The content of organic matter is moderate in the Kremlin soil and low in the Archin soil. Fertility is medium in the Kremlin soil and low in the Archin soil. Tilth is good in the Kremlin soil and poor in the Archin soil. The Archin soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is moderate in the Kremlin soil and slow in the Archin soil. Available water capacity is high in the Kremlin soil and moderate in the Archin soil. Runoff is slow on both soils. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the Archin soil is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Archin soil is a limitation. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that conserve moisture and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake in areas of the Archin soil.

These soils are suited to windbreaks and environmental plantings, but the sodium affected subsoil in the Archin soil is a limitation. Windbreaks can be established on the Archin soil, but optimum growth is unlikely.

The Kremlin soil is in capability unit IIIc-1, Silty range site, and windbreak suitability group 3; the Archin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9.

KyB—Kyle clay, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands and foot slopes. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape and 10 to 150 acres in size.

Typically, the surface layer is grayish brown clay about 5 inches thick. It is calcareous in the lower part. The subsoil is light brownish gray, very firm and firm, calcareous clay about 15 inches thick. The underlying material to a depth of 60 inches is light brownish gray and olive gray, calcareous clay. In some areas shale is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Hisle and Swanboy soils. These soils make up less than 15 percent of any one mapped area. The sodium affected Hisle soils are on small flats, generally below the Kyle soil. Swanboy soils have salts in the upper part

of the subsoil. They are in positions on the landscape similar to those of the Kyle soil.

The content of organic matter and fertility are low in the Kyle soil. Tilth is poor. Permeability is very slow. Available water capacity is moderate. Runoff is medium. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth.

This soil is suited to cultivated crops and to tame pasture and hay. Alfalfa, intermediate wheatgrass, and crested wheatgrass are examples of suitable pasture plants. Winter wheat and oats are the main cultivated crops. Measures that conserve moisture, improve tilth, and control erosion are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, minimizing tillage, and leaving crop residue on the surface. Contour farming and grassed waterways help to control erosion. Chiseling or subsoiling improves tilth and increases the rate of water intake.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-3; Clayey range site; windbreak suitability group 4C.

Le—Lallie silty clay loam. This deep, poorly drained, level soil is in old stream channels on flood plains. It is frequently flooded for long periods. Areas are oval and are 10 to 20 acres in size.

Typically, the surface layer is grayish brown, mottled silty clay loam about 5 inches thick. The underlying material to a depth of 60 inches is gray, mottled, calcareous silty clay and silty clay loam. In some areas sand and gravel are below a depth of 36 inches.

Included with this soil in mapping are small areas of Glendive, Hanly, and Havre soils. These soils make up less than 15 percent of any one mapped area. They are higher on the flood plains than the Lallie soil. Glendive and Hanly soils contain more sand throughout than the Lallie soil. Havre soils are loamy throughout.

The content of organic matter and fertility are low in the Lallie soil. Permeability is slow. Available water capacity is moderate. A seasonal high water table is within a depth of 1 foot. Runoff is very slow or ponded. The shrink-swell potential is high.

Nearly all of the acreage supports native grasses and is used for grazing. Some areas support a sparse stand of cottonwoods and willow near the outer edge of the channels. The trees and shrubs in these areas provide shelter for wildlife and livestock. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Many areas are potential sites for excavated ponds.

Because of the high water table, this soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings. It is suited to tame pasture and hay. Garrison creeping foxtail and reed canarygrass are examples of suitable pasture plants.

The capability unit is Vw-1; Clayey Overflow range site; windbreak suitability group 10.

LhD—Lismas-Hisle complex, 6 to 25 percent slopes. These well drained, moderately sloping to moderately steep soils are on uplands. The shallow Lismas soil is on the upper side slopes and on ridges. The moderately deep Hisle soil is on the lower side slopes. Areas are irregular in shape and 20 to 150 acres in size. They are 50 to 60 percent Lismas soil and 20 to 30 percent Hisle soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Lismas soil is olive gray clay about 3 inches thick. The underlying material also is olive gray clay. It has nests of gypsum crystals throughout. Olive shale is at a depth of about 15 inches.

Typically, the surface layer of the Hisle soil is gray silt loam about 1 inch thick. The subsoil is grayish brown and light olive gray, very firm clay about 21 inches thick. It has gypsum crystals in the lower part. The underlying material is olive gray clay. It has gypsum crystals and other salts throughout. Gray shale is at a depth of about 34 inches. In places the depth to shale is more than 40 inches.

Included with these soils in mapping are small areas of Sage and Swanboy soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. The deep Sage and Swanboy soils have a large content of salts. Sage soils are along narrow drainageways. Swanboy soils are on foot slopes. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits.

The content of organic matter and fertility are low in the Lismas and Hisle soils. Tilth is poor. The Hisle soil has a sodium affected subsoil that restricts the penetration of roots. Permeability is very slow in both soils. Available water capacity is very low in the Lismas soil and low or very low in the Hisle soil. The shrink-swell potential is high in both soils.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on the Lismas soil unless an adequate plant cover is maintained. Compaction is a problem if the Hisle soil is grazed when wet. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Proper stocking rates and timely deferment of grazing help to maintain maximum productivity.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The slope and shallow depth to shale in areas of the Lismas soil and the sodium affected subsoil in the Hisle soil are limitations.

The Lismas soil is in capability unit VIe-12 and Shallow Dense Clay range site; the Hisle soil is in capability unit VIs-3 and Thin Claypan range site; both soils are in windbreak suitability group 10.

LkD—Lismas-Winler clays, 6 to 25 percent slopes. These moderately sloping to moderately steep soils are on uplands. The shallow Lismas soil is on ridges and the upper side slopes. The moderately deep Winler soil is on the lower side slopes. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape and 10 to 150 acres in size. They are 40 to 50 percent Lismas soil and 25 to 35 percent Winler soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Lismas soil is olive gray clay about 3 inches thick. The underlying material also is olive gray clay. It has nests of gypsum crystals throughout. Olive shale is at a depth of about 15 inches.

Typically, the surface layer of the Winler soil is grayish brown clay about 3 inches thick. The subsoil is grayish brown and light brownish gray, very firm clay about 13 inches thick. It has nests of gypsum crystals in the lower part. The underlying material is light brownish gray clay. It has nests of gypsum crystals and fragments of clayey shale throughout. Clayey shale is at a depth of about 25 inches. In places salts are in the upper part of the subsoil. In some areas the depth to shale is more than 40 inches.

Included with these soils in mapping are small areas of Hisle, Hisle Variant, Sage, and Swanboy soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected Hisle and Hisle Variant soils are in small pits and depressions. The deep Sage and Swanboy soils have a high content of salts throughout. Sage soils are in drainageways, and Swanboy soils are on low foot slopes.

The content of organic matter and fertility are low in the Lismas and Winler soils. Tilth is poor. Permeability is very slow. Available water capacity is low in the Winler soil and low or very low in the Lismas soil. Runoff is high on both soils. The shrink-well potential is very high.

Most of the acreage supports native grasses and is used for grazing. Compaction and erosion are problems. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Proper stocking rates and timely deferment of grazing help to control erosion and maintain maximum productivity.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The slope and the low or very low available water capacity are limitations.

The Lismas soil is in capability unit VIe-12 and Shallow Dense Clay range site; the Winler soil is in capability unit VIe-4 and Dense Clay range site; both soils are in windbreak suitability group 10.

LrF—Lismas-Rock outcrop complex, 15 to 60 percent slopes. This map unit occurs as areas of a shallow, well drained, moderately steep and steep Lismas soil intermingled with areas where shale crops out. The unit is on uplands. The Lismas soil is on side slopes. The Rock outcrop is on convex slopes and steep escarpments. Areas are irregular in shape and 10 to 60 acres in size. They are 50 to 60 percent Lismas soil and 20 to 30 percent Rock outcrop. The Lismas soil and Rock outcrop occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Lismas soil is olive gray clay about 3 inches thick. The underlying material also is olive gray clay. It has nests of gypsum crystals throughout. Olive shale is at a depth of about 15 inches. In places the depth to shale is 20 to 40 inches.

The Rock outcrop is olive gray clayey shale. It supports little or no vegetation.

Included with the Lismas soil and Rock outcrop in mapping are small areas of Hisle, Sage, and Swanboy soils. These soils make up less than 25 percent of any one mapped area. The sodium affected Hisle soils are on small flats below the Lismas soil. The deep Sage and Swanboy soils have a high content of salts throughout. Sage soils are in drainageways, and Swanboy soils are on foot slopes.

The content of organic matter and fertility are low in the Lismas soil. Tilth is poor. Permeability is very slow. Available water capacity is very low. Runoff is rapid. The shrink-swell potential is very high.

All areas of the Lismas soil support native grasses and are used for grazing. Water erosion is a problem. In places gullies form along cattle trails. Reestablishing vegetation is difficult. The Rock outcrop does not support grazable vegetation.

This map unit is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The steep slope, the shallow depth to shale, and the Rock outcrop are limitations.

The Lismas soil is in capability unit VIIe-5, Shallow Dense Clay range site, and windbreak suitability group 10; the Rock outcrop is in capability unit VIIIs-1 and is not assigned to a range site or windbreak suitability group.

MaB—Marmarth fine sandy loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape and 10 to 100 acres in size.

Typically, the surface layer is brown fine sandy loam about 7 inches thick. The subsoil is about 28 inches of brown, grayish brown, and light brownish gray, friable and very friable, sandy clay loam, loam, and fine sandy loam. It is calcareous in the lower part. Weakly cemented sandstone is at a depth of about 35 inches. In places the depth to sandstone is more than 40 inches. In some areas the subsoil contains less clay and more sand.

Included with this soil in mapping are small areas of Blackhall, Bullock, Cabbart, Parchin, and Twilight soils. These soils make up less than 15 percent of any one mapped area. The shallow Blackhall and Cabbart soils are on ridges. The sodium affected Bullock and Parchin soils are in small pits and depressions. Twilight soils are in positions on the landscape similar to those of the Marmarth soil. They have less clay and more sand in the subsoil than the Marmarth soil. Also, they have a lighter colored surface layer.

The content of organic matter is moderate in the Marmarth soil, and fertility is medium. Tilth is fair. Permeability is moderate. Available water capacity is low. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay, but it is somewhat droughty. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture species. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and contour farming.

This soil is suited to windbreaks and environmental plantings, but the moderate depth to bedrock is a limitation. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIIe-1; Silty range site; windbreak suitability group 6R.

McC—Marmarth-Cabbart complex, 6 to 9 percent slopes. These well drained, moderately sloping soils are on uplands. The moderately deep Marmarth soil is on side slopes. The shallow Cabbart soil is on the crest of ridges. Areas are irregular in shape and 10 to 90 acres in size. They are 45 to 55 percent Marmarth soil and 20 to 30 percent Cabbart soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Marmarth soil is brown fine sandy loam about 7 inches thick. The subsoil is about 28 inches of brown, grayish brown, and light brownish gray, friable and very friable sandy clay loam, loam, and fine sandy loam. It is calcareous in the lower part. Weakly consolidated sandstone is at a depth of about 35 inches. In places the depth to sandstone is more than 40 inches. In some areas the subsoil contains less clay.

Typically, the surface layer of the Cabbart soil is light yellowish brown, calcareous loam about 4 inches thick. The subsoil is pale yellow, very friable, calcareous loam about 7 inches thick. Weakly consolidated layers of sandstone, siltstone, and shale are at a depth of about 11 inches. In some areas the surface layer and subsoil are fine sandy loam.

Included with these soils in mapping are small areas of Bullock, Chinook, Parchin, Rhame, and Twilight soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected Bullock and Parchin soils are on small flats and in pits and depressions. The deep Chinook soils are on foot slopes. Rhame and Twilight soils are in positions on the landscape similar to those of the Marmarth soil. They have more sand and less clay in the subsoil than the Marmarth soil.

The content of organic matter is moderate in the Marmarth soil and low in the Cabbart soil. Fertility is medium in the Marmarth soil and low in the Cabbart soil. Tilth is fair in the Marmarth soil and poor in the Cabbart soil. Permeability is moderate in both soils. Available water capacity is low in the Marmarth soil and very low in the Cabbart soil. Runoff is medium on both soils. The shrink-swell potential is moderate in the Marmarth soil and low in the Cabbart soil.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Water erosion is a hazard, however, if the range is overgrazed. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Alfalfa and intermediate wheatgrass are examples of pasture plants that are suited to the Marmarth soil. No pasture plants are suited to the Cabbart soil. Winter wheat, spring wheat, oats, and alfalfa are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and contour farming.

The Marmarth soil is suited to windbreaks and environmental plantings, but the Cabbart soil generally is unsuited. The depth to bedrock in both soils is a limitation. Windbreaks can be established on the Marmarth soil, but optimum growth is unlikely. No trees or shrubs grow well on the Cabbart soil. Planting on the contour helps to control erosion.

The Marmarth soil is in capability unit IVe-1, Silty range site, and windbreak suitability group 6R; the Cabbart soil is in capability unit VIe-11, Shallow range site, and windbreak suitability group 10.

MpB—Marmarth-Parchin fine sandy loams, 2 to 6 percent slopes. These moderately deep, well drained, undulating soils are on uplands. The Marmarth soil is on concave slopes. The sodium affected Parchin soil is on the lower side slopes. Areas are irregular in shape and 10 to 100 acres in size. They are 45 to 55 percent Marmarth soil and 20 to 30 percent Parchin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Marmarth soil is brown fine sandy loam about 7 inches thick. The subsoil is about 28 inches of brown, grayish brown, and light brownish gray, friable and very friable sandy clay loam, loam, and fine sandy loam. It is calcareous in the lower part. Weakly consolidated sandstone is at a depth of about 35 inches. In places the depth to bedrock is more than 40 inches. In some areas the subsoil contains less clay.

Typically, the surface layer of the Parchin soil is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is light brownish gray fine sandy loam about 5 inches thick. The subsoil is about 18 inches thick. It is firm. The upper part is brown sandy clay loam. The lower part is grayish brown and light brownish gray, calcareous sandy clay loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material is light gray, calcareous sandy clay loam. It has nests of gypsum crystals and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches. In places the depth to bedrock is more than 40 inches. In some areas the subsoil contains more clay.

Included with these soils in mapping are small areas of Blackhall, Bullock, Cabbart, Delridge, Rhame, and Twilight soils. These included soils make up less than 25 percent of any one mapped area. The shallow Blackhall and Cabbart soils are on ridges. Bullock soils are in small pits and depressions. Their surface layer is not so thick as that of the Parchin soil. Delridge soils are higher on the landscape than the Marmarth soil. Also, their surface layer is not so dark and is calcareous. Rhame and Twilight soils are in positions on the landscape similar to those of the Marmarth soil. They have more sand and less clay in the subsoil than the Marmarth soil.

The content of organic matter is moderate in the Marmarth soil and low in the Parchin soil. Fertility is medium in the Marmarth soil and low in the Parchin soil. Tilth is fair in the Marmarth soil and poor in the Parchin soil. The Parchin soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is moderate in the Marmarth soil and slow or very slow in the Parchin soil. Available water capacity is low in both soils. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Parchin soil is a limitation. Intermediate wheatgrass and crested wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control wind erosion, conserve moisture, and improve tilth are the main management needs in cultivated areas. Examples are stripcropping, leaving crop residue on the surface, and minimizing tillage. Chiseling or subsoiling improves tilth and increases the rate of water intake in areas of the Parchin soil.

These soils are suited to windbreaks and environmental plantings, but the moderate depth to bedrock in the Marmarth soil and the sodium affected subsoil in the Parchin soil are limitations. Windbreaks can be established, but optimum growth is unlikely.

The Marmarth soil is in capability unit IIIe-1, Silty range site, and windbreak suitability group 6R; the Parchin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9.

MtC—Marmarth-Twilight fine sandy loams, 6 to 9 percent slopes. These moderately deep, well drained, gently sloping soils are on uplands. The Marmarth soil is on the middle and lower side slopes. The Twilight soil is on the upper side slopes and on ridges. Areas are irregular in shape and 10 to 80 acres in size. They are 45 to 55 percent Marmarth soil and 25 to 35 percent Twilight soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Marmarth soil is brown fine sandy loam about 7 inches thick. The subsoil is about 28 inches of brown, grayish brown and light brownish gray, friable and very friable sandy clay loam, loam, and fine sandy loam. It is calcareous in the lower part. Weakly consolidated sandstone is at a depth of about 35 inches. In places the depth to bedrock is more than 40 inches. In some areas the subsoil contains less clay.

Typically, the surface layer of the Twilight soil is grayish brown fine sandy loam about 4 inches thick. The subsoil is about 18 inches of brown and yellowish brown, very friable fine sandy loam and sandy loam. The underlying material is light olive brown sandy loam. Soft sandstone and shale bedrock is at a depth of about 30 inches.

Included with these soils in mapping are small areas of Blackhall, Bullock, Cabbart, and Parchin soils. These included soils make up less than 25 percent of any one mapped area. The shallow Blackhall and Cabbart soils are on ridges. The sodium affected Bullock and Parchin soils are on small flats and in pits.

The content of organic matter is moderate in the Marmarth soil and low in the Twilight soil. Fertility is medium in the Marmarth soil and low in the Twilight soil. Tilth is fair in both soils. Permeability is moderate in the Marmarth soil and moderately rapid in the Twilight soil. Available water capacity is low in both soils. Runoff is medium. The shrink-swell potential is moderate in the Marmarth soil and low in the Twilight soil.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the range is overgrazed.

These soils are suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass is an example of a suitable pasture plant. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control wind erosion and conserve moisture in areas of both soils and that improve the fertility of the Twilight soil are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including tame grasses and legumes in the cropping system.

These soils are suited to windbreaks and environmental plantings, but the moderate depth to bedrock is a limitation. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control water erosion. Preparing the site for planting in the spring helps to control wind erosion.

The Marmarth soil is in capability unit IVe-1 and Silty range site; the Twilight soil is in capability unit IVe-7 and Sandy range site; both soils are in windbreak suitability group 6R.

MtD—Marmarth-Twilight fine sandy loams, 9 to 15 percent slopes. These moderately deep, well drained, strongly sloping soils are on uplands. The Marmarth soil is on the middle and lower side slopes. The Twilight soil is on the upper side slopes and on ridges. Areas are irregular in shape and 10 to 50 acres in size. They are 40 to 50 percent Marmarth soil and 30 to 40 percent Twilight soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Marmarth soil is brown fine sandy loam about 7 inches thick. The subsoil is about 28 inches of brown, grayish brown, and light brownish gray, friable and very friable sandy clay loam, loam, and fine sandy loam. It is calcareous in the lower part. Weakly consolidated sandstone is at a depth of about 35 inches. In places the depth to bedrock is more than 40 inches. In some areas the subsoil contains less clay.

Typically, the surface layer of the Twilight soil is grayish brown fine sandy loam about 4 inches thick. The subsoil is about 18 inches of brown and yellowish brown, very friable fine sandy loam and sandy loam. The underlying material is light olive brown sandy loam. Soft sandstone and shale bedrock is at a depth of about 30 inches.

Included with these soils in mapping are small areas of Blackhall, Bullock, Cabbart, and Parchin soils. These included soils make up less than 25 percent of any one mapped area. The shallow Blackhall and Cabbart soils are on ridges. The sodium affected Bullock and Parchin soils are in small pits and depressions.

The content of organic matter is moderate in the Marmarth soil and low in the Twilight soil. Fertility is medium in the Marmarth soil and low in the Twilight soil. Tilth is fair in both soils. Permeability is moderate in the Marmarth soil and moderately rapid in the Twilight soil. Available water capacity is low in both soils. Runoff is medium. The shrink-swell potential is moderate in the Marmarth soil and low in the Twilight soil.

Nearly all of the acreage supports native grasses and is used for grazing. Wind erosion is a hazard if the range is overgrazed. Proper stocking rates and timely deferment of grazing help to maintain maximum productivity.

Mainly because of the slope, these soils generally are unsuited to cultivated crops. They are suited to tame pasture and hay. Intermediate wheatgrass is an example of a suitable pasture plant.

These soils are suited to windbreaks and environmental plantings, but the moderate depth to bedrock is a limitation. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control water erosion. Preparing the site for planting in the spring helps to control wind erosion.

The capability unit is VIe-7, and the windbreak suitability group is 6R; the Marmarth soil is in Silty range site, and the Twilight soil is in Sandy range site.

NaD—Nihill Variant-Attewan complex, 4 to 40 percent slopes. These well drained, strongly sloping to steep soils are on uplands. Scattered boulders and stones are on the surface. The very gravelly Nihill Variant soil is on narrow ridges below the Attewan soil. The Attewan soil is on small plateaus. It is moderately deep to gravelly material. Areas are irregular in shape and 10 to 100 acres in size. They are about 45 to 55 percent Nihill Variant soil and 30 to 45 percent Attewan soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Nihill Variant soil is dark grayish brown, calcareous very gravelly loam about 3 inches thick. The underlying material is pale brown and

light gray, calcareous very gravelly loam and fine sand. Light gray, soft sandstone is at a depth of about 30 inches.

Typically, the surface layer of the Attewan soil is grayish brown loam about 5 inches thick. The subsoil is about 27 inches thick. It is grayish brown and friable. It is clay loam and loam in the upper part and calcareous sandy clay loam in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous, stratified very gravelly loamy sand and very gravelly loam. In some areas the depth to the gravelly underlying material is more than 40 inches.

Included with these soils in mapping are small areas of Archin, Blackhall, Boxwell, Cabbart, Delridge, Kirby, and Marmarth soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected Archin soils are on small flats and in pits. Blackhall, Cabbart, and Kirby soils are in positions on the landscape similar to those of the Nihill Variant soil. Blackhall and Cabbart soils are 10 and 20 inches deep over bedrock. Kirby soils are 10 to 20 inches deep to fractured porcellanite. The moderately deep Boxwell, Delridge, and Marmarth soils are on low side slopes. They contain less gravel than the Nihill Variant soil.

The content of organic matter is low in the Nihill Variant soil and moderate in the Attewan soil. Fertility is low in the Nihill Variant soil and medium in the Attewan soil. Tilth is poor in the Nihill Variant soil and good in the Attewan soil. Permeability is moderately rapid in the Nihill Variant soil. It is moderate in the subsoil of the Attewan soil and rapid in the underlying material. Available water capacity is low in both soils. The shrink-swell potential is low in the Nihill Variant soil. It is moderate in the subsoil of the Attewan soil and low in the underlying material.

Nearly all of the acreage supports native grasses and is used for grazing. Productivity is limited because the Nihill Variant soil is droughty. Water erosion is a hazard if the range is overgrazed. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The droughtiness of both soils is a limitation. Pasture plants can be established in the less sloping areas of the Attewan soil. Environmental plantings also can be established in these areas, but optimum growth and survival are unlikely.

The Nihill Variant soil is in capability unit VIIs-7, Thin Upland range site, and windbreak suitability group 10; the Attewan soil is in capability unit VIe-2, Silty range site, and windbreak suitability group 6G.

PbB—Parchin-Bullock fine sandy loams, 2 to 9 percent slopes. These moderately deep, well drained, gently sloping and moderately sloping soils are on uplands (fig. 8). The Parchin soil is on slight rises. The Bullock soil is in small pits and depressions. Areas are irregular in shape and 10 to more than 1,000 acres in size. They are 40 to 50 percent Parchin soil and 20 to 35 percent Bullock soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Parchin soil is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is light brownish gray fine sandy loam about 5 inches thick. The subsoil is about 18 inches thick. It is firm. The upper part is brown sandy clay loam. The lower part is grayish brown and light brownish gray, calcareous sandy clay loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material is light gray, calcareous sandy clay loam. It has nests of gypsum crystals and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Bullock soil is grayish brown and light brownish gray fine sandy loam about 4 inches thick. The subsoil is about 16 inches thick. It is firm. The upper part is grayish brown sandy clay loam. The lower part is light brownish gray and light gray, calcareous sandy clay loam, loam, and clay loam. It has nests of gypsum and other salts. The underlying material is light olive gray, calcareous very fine sandy loam. It has nests of gypsum crystals and other salts throughout. Light gray, soft sandstone is at a depth of about 29 inches. In places the subsoil contains more clay.

Included with these soils in mapping are small areas of Blackhall, Cabbart, Delridge, Marmarth, Rhame, and Twilight soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. The shallow Blackhall and Cabbart soils are on ridges. Delridge, Marmarth, Rhame, and Twilight soils are slightly higher on the landscape than the Parchin and Bullock soils. They do not have a sodium affected subsoil. Slickspots are in small pits and depressions. They have a high content of salts throughout. They generally do not support vegetation.

The content of organic matter and fertility are low in the Parchin and Bullock soils. Tilth is poor. The sodium affected subsoil restricts the penetration of plant roots. Permeability is slow or very slow in the Parchin soil and very slow in the Bullock soil. Available water capacity is low in both soils. Runoff is medium. The shrink-swell potential is moderate in the subsoil of the Parchin soil and low in the underlying material. It is moderate in the Bullock soil.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a hazard in overgrazed areas of the Parchin soil. Compaction is a problem on the Bullock soil. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Proper stocking rates and timely

Figure 8.—An area of Parchin-Bullock fine sandy loams, 2 to 9 percent slopes. The Parchin soil is on the slight rises. The Bullock soil is in the lower areas.

deferment of grazing help to maintain maximum productivity.

This map unit is poorly suited to cultivated crops and to tame pasture and hay because the sodium affected subsoil restricts the penetration of plant roots. No crops grow well on the Bullock soil. Western wheatgrass and crested wheatgrass are examples of suitable pasture plants. Winter wheat, spring wheat, and oats are the main cultivated crops. Measures that control wind erosion and improve tilth are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and minimizing tillage. Chiseling or subsoiling improves tilth and increases the rate of water intake.

The Parchin soil is suited to windbreaks and environmental plantings, but the Bullock soil generally is unsuited. The sodium affected subsoil in both soils restricts the penetration of plant roots. Trees and shrubs can be established on the Parchin soil, but optimum growth, survival, and vigor are unlikely. No trees or shrubs grow well on the Bullock soil.

The Parchin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9; the Bullock soil is in capability unit VIs-3, Thin Claypan range site, and windbreak suitability group 10.

PhA—Parshall fine sandy loam, 0 to 3 percent slopes. This deep, well drained, nearly level soil is on terraces and fans. Areas are 10 to 100 acres in size and are irregular in shape.

Typically, the surface layer is grayish brown fine sandy loam about 8 inches thick. The subsoil is grayish brown, very friable fine sandy loam about 34 inches thick. The underlying material to a depth of 60 inches is brown fine

sandy loam. In some areas the surface layer is thinner. In other areas the lower part of the subsoil and the underlying material are calcareous.

Included with this soil in mapping are small areas of Archin, Assinniboine, Bullock, Chinook, Daglum, Eapa, and Rhoades soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Archin, Bullock, Daglum, and Rhoades soils have a sodium affected subsoil. Archin and Daglum soils are on small flats, and Bullock and Rhoades soils are in small depressions. Assinniboine, Chinook, and Eapa soils are slightly higher on the landscape than the Parshall soil. Also, Assinniboine and Eapa soils contain more clay in the subsoil, and Chinook soils have a lighter colored surface layer. Slickspots are in small pits and depressions. They have a dispersed surface layer and a high content of salts throughout. They do not support vegetation.

The content of organic matter is moderate in the Parshall soil, and fertility is medium. Permeability is moderately rapid. Available water capacity is moderate. Runoff is slow. The shrink-swell potential is low.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Crested wheatgrass and intermediate wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Controlling wind erosion and conserving moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, including grasses and legumes in the cropping system, and stripcropping. Establishing field windbreaks also helps to control wind erosion.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Preparing the site for planting in the spring helps to control wind erosion.

The capability unit is IIIe-7; Sandy range site; windbreak suitability group 5.

Pt—Pits, gravel. These are open excavations, 5 to 30 feet deep, from which sand and gravel are being removed. Slopes are uneven and broken. They range from nearly level on the bottom of the pits to almost vertical on the rims. Areas are irregular in shape and 10 to 100 acres in size.

The bottom of the pits typically is sand and gravel, but it is sandstone or siltstone bedrock where all of the sand and gravel has been removed. Mounds of mixed loamy overburden are on the edges of the pits. The bottom and sides support little or no vegetation during periods when the pits are being used.

Most of the pits can be used only as a source of sand and gravel for construction purposes. Some provide limited wildlife habitat. Abandoned gravel pits can be restored to range or tame pasture if reclamation measures are applied. These measures include shaping the areas and using the mounds of overburden material as topsoil dressing. Applying fertilizer as needed helps to establish range or pasture plants.

The capability unit is VIIIs-2; no range site or windbreak suitability group is assigned.

RbB—Reeder loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape and 10 to 150 acres in size.

Typically, the surface layer is grayish brown loam about 6 inches thick. The subsoil is about 24 inches of grayish brown, light brownish gray, and light gray, friable clay loam and loam. It is calcareous in the lower part. Light gray, soft sandstone is at a depth of about 30 inches. In some areas the subsoil contains less clay. In other areas the depth to bedrock is more than 40 inches. In places the slope is as much as 9 percent.

Included with this soil in mapping are small areas of Cabba, Daglum, Lantry, and Rhoades soils. These soils make up less than 15 percent of any one mapped area. The shallow Cabba soils and the calcareous Lantry soils are on ridges. The sodium affected Daglum and Rhoades soils are in small pits and depressions.

The content of organic matter is moderate in the Reeder soil, and fertility is medium. Tilth is good. Permeability is moderate. Available water capacity is low or moderate. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, barley, oats, alfalfa, and grain sorghum are the main cultivated crops. A small acreage of corn and sorghum is harvested for silage. Measures that conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and farming on the contour.

This soil is suited to windbreaks and environmental plantings, but the moderate depth to bedrock is a limitation. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIe-1; Silty range site; windbreak suitability group 6R.

RcC—Reeder-Cabba loams, 6 to 9 percent slopes. These well drained, moderately sloping soils are on uplands. The moderately deep Reeder soil is on side slopes. The shallow Cabba soil is on ridges. Areas are irregular in shape and 15 to 100 acres in size. They are 55 to 65 percent Reeder soil and 20 to 30 percent Cabba soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Reeder soil is grayish brown loam about 6 inches thick. The subsoil is about 24 inches of grayish brown, light brownish gray, and light gray, friable clay loam and loam. It is calcareous in the lower part. Light gray, soft sandstone is at a depth of about 30 inches. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Cabba soil is light brownish gray, calcareous loam about 2 inches thick. The subsoil is light brownish gray and light yellowish brown, friable, calcareous loam. Light gray and light brownish gray, calcareous, soft sandstone is at a depth of about 15 inches. In some areas the slope is as much as 15 percent.

Included with these soils in mapping are small areas of Arnegard, Daglum, Grail, and Rhoades soils. These included soils make up less than 25 percent of any one mapped area. Arnegard and Grail soils are dark to a depth of more than 16 inches. They are in swales. The sodium affected Daglum and Rhoades soils are on small flats and in small depressions.

The content of organic matter is moderate in the Reeder soil and low in the Cabba soil. Fertility is medium in the Reeder soil and low in the Cabba soil. Permeability is moderate in both soils. Available water capacity is low or moderate in the Reeder soil and very low in the Cabba soil. Runoff is medium on both soils. The shrink-swell potential is moderate in the Reeder soil and low in the Cabba soil.

About half of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Water erosion is a hazard, however, if the range is overgrazed. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Alfalfa and intermediate wheatgrass are examples of pasture plants that are suited to Reeder soil. No pasture plants are suited to the shallow Cabba soil. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, including grasses and legumes in the cropping system, and farming on the contour.

The Reeder soil is suited to windbreaks and environmental plantings, but the Cabba soil generally is unsuited. The depth to bedrock in both soils is a limitation. Windbreaks can be established on the Reeder soil, but optimum growth is unlikely. No trees or shrubs grow well on the Cabba soil. Planting on the contour helps to control erosion.

The Reeder soil is in capability unit IIIe-2, Silty range site, and windbreak suitability group 6R; the Cabba soil is in capability unit VIe-11, Shallow range site, and windbreak suitability group 10.

ReB—Reeder-Rhoades loams, 2 to 6 percent slopes. These moderately deep, well drained, gently sloping soils are on uplands. The Reeder soil is on the smooth side slopes. Scattered stones are on the surface in some areas. The Rhoades soil is in small pits and depressions. Areas are irregular in shape and 15 to more than 75 acres in size. They are 50 to 65 percent Reeder soil and 20 to 35 percent Rhoades soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Reeder soil is grayish brown loam about 6 inches thick. The subsoil is about 24 inches of grayish brown, light brownish gray, and light gray, friable clay loam and loam. It is calcareous in the lower part. Light gray, soft sandstone is at a depth of about 30 inches. In places the subsoil contains less clay. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Rhoades soil is grayish brown loam about 2 inches thick. The subsoil is about 30 inches of grayish brown, firm silty clay loam and silty clay. In the lower part it is calcareous and has nests of gypsum crystals and other salts. Soft sandstone is at a depth of about 32 inches. In some areas the subsoil contains less clay. In places the depth to bedrock is more than 40 inches.

Included with these soils in mapping are small areas of Cabba, Daglum, Grail, and Tanna soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. The shallow Cabba soils are on ridges. Daglum soils have a surface layer that is thicker than that of the Rhoades soil. They are on slight rises. Grail soils are dark to a depth of more than 16 inches. They are in swales. Tanna soils have more clay in the subsoil than the Reeder soil. They are in positions on the landscape similar to those of the Reeder soil. Slickspots have a dispersed surface and a high content of salts throughout. They generally do not support vegetation. They are in small pits.

The content of organic matter is moderate in the Reeder and Rhoades soils. Fertility is medium in the Reeder soil and low in the Rhoades soil. Tilth is good in the Reeder soil and poor in the Rhoades soil. The Rhoades soil has a sodium affected subsoil that restricts the penetration of plant roots. Available water capacity is

low or moderate in the Reeder soil and low in the Rhoades soil. The shrink-swell potential is moderate in the Reeder soil and high in the Rhoades soil.

About half of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range; however, the Rhoades soil is subject to compaction. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Crop growth is severely restricted on the Rhoades soil because of the dense, sodium affected subsoil. Examples of tame pasture plants that are suited to the Reeder soil are intermediate wheatgrass, crested wheatgrass, and alfalfa. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that control erosion, conserve moisture, and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage and leaving crop residue on the surface. Chiseling or subsoiling improves tilth and increases the rate of water intake.

The Reeder soil is suited to windbreaks and environmental plantings, but the Rhoades soil generally is unsuited. The moderate depth to bedrock in both soils and the sodium affected subsoil in the Rhoades soil are limitations. Windbreaks can be established on the Reeder soil, but optimum growth is unlikely. No trees or shrubs grow well on the Rhoades soil.

The Reeder soil is in capability unit IIe-1, Silty range site, and windbreak suitability group 6R; the Rhoades soil is in capability unit VIs-1, Thin Claypan range site, and windbreak suitability group 10.

RfE—Reva-Slimbutte complex, 9 to 70 percent slopes. These well drained, strongly sloping to very steep soils are on uplands. The shallow Reva soil is on side slopes and the crest of narrow ridges. The deep Slimbutte soil is on the lower sides of the ridges. Areas are irregular in shape and about 25 to 150 acres in size. They are about 60 to 70 percent Reva soil and 20 to 30 percent Slimbutte soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Reva soil is light brownish gray, calcareous gravelly very fine sandy loam about 3 inches thick. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. Very hard, slightly fractured sandstone is at a depth of about 16 inches. In some places the sandstone is soft. In other places the surface layer is darker. In some areas the soil is sandy. In other areas it contains more silt and clay.

Typically, the surface layer of the Slimbutte soil is grayish brown very fine sandy loam about 5 inches thick. The subsoil is about 19 inches thick. It is gray, friable gravelly very fine sandy loam in the upper part and light brownish gray, very friable, calcareous very gravelly very fine sandy loam in the lower part. The upper part of the underlying material is gray and white, calcareous very gravelly very fine sandy loam and very cobbly fine sandy loam. The lower part to a depth of 60 inches is white cobbles, stones, and pebbles. In places hard, fractured bedrock is below a depth of 40 inches.

Included with these soils in mapping are small areas of Arnegard, Rockoa, and Vanocker soils and Rock outcrop. These inclusions make up less than 25 percent of any one mapped area. Arnegard soils are on foot slopes and in drainageways below the Slimbutte soil. They are dark to a depth of 16 to 30 inches. Rockoa soils are in the less sloping areas. They support forest vegetation. They have more clay in the subsoil than the Reva and Slimbutte soils. Vanocker soils are in positions on the landscape similar to those of the Slimbutte soil. They do not have a dark surface and subsoil. Rock outcrop is on most vertical escarpments and nearly barren ridgetops.

Fertility is low in the Reva soil and medium in the Slimbutte soil. The content of organic matter is low in the Reva soil and moderate in the Slimbutte soil. Permeability is moderately rapid in the Reva soil. It is moderate or moderately rapid in the upper part of the Slimbutte soil and rapid in the lower part. Available water capacity is very low in the Reva soil and low in the Slimbutte soil. Runoff is medium or rapid on both soils. The shrink-swell potential is low.

Almost all of the acreage supports native grasses and is used for grazing. Erosion is a very severe hazard, especially in overgrazed areas. Livestock tend to graze the lower parts of the landscape more intensely than the steeper ridges. Some areas have a sparse stand of deciduous trees and shrubs, which provide shelter for livestock and wildlife. Deferred grazing helps to control erosion in overgrazed areas. Reseeding is difficult because of the slope of both soils and the shallow depth to bedrock in the Reva soil. The number of potential sites for livestock watering facilities is limited because seepage is a hazard.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The slope of both soils and the shallow depth to hard bedrock in the Reva soil are limitations.

The capability unit is VIIe-7, and the windbreak suitability group is 10; the Reva soil is in Shallow range site, and the Slimbutte soil is in Stony Hills range site.

RgE—Reva-Rock outcrop complex, 15 to 70 percent slopes. This map unit occurs as areas of a well drained, shallow, moderately steep to very steep Reva soil intermingled with areas where bedrock crops out. The unit is on uplands. The Reva soil is on narrow ridges and side slopes. The Rock outcrop is on the high ridges and in rimrock areas. Areas are irregular in shape and 50

to 200 acres in size. They are 55 to 65 percent Reva soil and 20 to 30 percent Rock outcrop. The Reva soil and Rock outcrop occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Reva soil is light brownish gray, calcareous gravelly very fine sandy loam about 3 inches thick. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. White, hard sandstone is at a depth of about 16 inches.

The Rock outcrop is unweathered, slightly fractured, hard sandstone.

Included with the Reva soil and Rock outcrop in mapping are small areas of Rockoa, Slimbutte, Vanocker, and Watrous soils. These soils make up less than 25 percent of any one mapped area. The deep Rockoa soils are on the less sloping parts of the landscape. The deep Slimbutte soils have a dark surface layer. They are on low side slopes. The deep Vanocker soils are in positions on the landscape similar to those of the Reva soil. The moderately deep, gently sloping Watrous soils are on the prairies above the Reva soil.

The content of organic matter and fertility are low in the Reva soil. Permeability is moderately rapid. Available water capacity is very low. Runoff is rapid.

All areas of the Reva soil support native grasses and are used for grazing. Water erosion is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying. In some areas trees and shrubs provide limited protection for livestock and wildlife.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The Rock outcrop is an additional limitation.

The Reva soil is in capability unit VIIe-7, Shallow range site, and windbreak suitability group 10; the Rock outcrop is in capability unit VIIIs-1 and is not assigned to a range site or windbreak suitability group.

RhB—Rhame fine sandy loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape and 10 to more than 70 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 5 inches thick. The subsoil is about 17 inches thick. It is very friable. It is dark grayish brown and pale brown fine sandy loam in the upper part and light yellowish brown sandy loam in the lower part. The underlying material is light gray sandy loam. Soft sandstone is at a depth of about 28 inches. In places the surface layer is not so dark. In some areas the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of Blackhall, Bullock, Marmarth, and Parchin soils. These soils make up less than 25 percent of any one mapped area. The shallow Blackhall soils are on ridges. The sodium affected Bullock and Parchin soils are in small pits and depressions. Marmarth soils have more clay in the subsoil than the Rhame soil. They are in positions on the landscape similar to those of the Rhame soil.

The content of organic matter is moderate in the Rhame soil, and fertility is medium. Tilth is fair. Permeability is moderately rapid. Available water capacity is low or very low. Runoff is medium.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay, but it is somewhat droughty. Alfalfa, intermediate wheatgrass, and crested wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control wind erosion and conserve moisture are the main management needs in cultivated areas. Examples are stripcropping, minimizing tillage, including grasses and legumes in the cropping system, and leaving crop residue on the surface. Establishing field windbreaks also helps to control wind erosion.

This soil is suited to windbreaks and environmental plantings. Optimum growth is unlikely, however, because the soil is droughty. Planting on the contour helps to control water erosion. Preparing the site for planting in the spring helps to control wind erosion.

The capability unit is IVe-6; Sandy range site; windbreak suitability group 6R.

RmB—Rhame-Parchin fine sandy loams, 2 to 6 percent slopes. These moderately deep, well drained, undulating soils are on uplands. The Rhame soil is on the convex parts of the landscape. The Parchin soil is in small depressions and on flats. Areas are irregular in shape and 10 to 100 acres in size. They are 55 to 65 percent Rhame soil and 25 to 35 percent Parchin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Rhame soil is grayish brown fine sandy loam about 5 inches thick. The subsoil is about 17 inches thick. It is very friable. It is dark grayish brown and pale brown fine sandy loam in the upper part and light yellowish brown sandy loam in the lower part. The underlying material is light gray sandy loam. Soft sandstone is at a depth of about 28 inches. In places the surface layer is not so dark. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Parchin soil is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is light brownish gray fine sandy loam about 5 inches thick. The subsoil is about 18 inches

thick. It is firm. The upper part is brown sandy clay loam. The lower part is grayish brown and light brownish gray, calcareous sandy clay loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material is light gray, calcareous sandy clay loam. It has nests of gypsum crystals and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches. In places the subsoil contains more clay. In some areas the depth to bedrock is more than 40 inches.

Included with these soils in mapping are small areas of Blackhall and Bullock soils. These included soils make up less than 25 percent of any one mapped area. The shallow Blackhall soils are on ridges. Bullock soils are in small pits and depressions. Their surface layer is not so thick as that of the Parchin soil.

The content of organic matter is moderate in the Rhame soil and low in the Parchin soil. Fertility is medium in the Rhame soil and low in the Parchin soil. Tilth is fair in the Rhame soil and poor in the Parchin soil. The Parchin soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is moderately rapid in the Rhame soil and slow or very slow in the Parchin soil. Available water capacity is low in both soils. Runoff is medium. The shrink-swell potential is low in the Rhame soil. It is moderate in the subsoil of the Parchin soil and low in the underlying material.

Most of the acreage supports native grasses and is used for grazing (fig. 9). Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to cultivated crops and to tame pasture or hay, but droughtiness in the Rhame soil and the sodium affected subsoil in the Parchin soil are limitations. Intermediate wheatgrass, crested wheatgrass, and alfalfa are suitable tame pasture plants. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control wind erosion, conserve moisture, and improve tilth are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including tame grasses and legumes in the cropping system. Chiseling and subsoiling also improve tilth.

These soils are suited to windbreaks and environmental plantings, but optimum growth is unlikely because the Rhame soil is somewhat droughty and the Parchin soil has a sodium affected subsoil. Preparing the site for planting in the spring helps to control wind erosion.

The Rhame soil is in capability unit IVe-6, Sandy range site, and windbreak suitability group 6R; the Parchin soil is in capability unit IVe-12, Claypan range site, and windbreak suitability group 9.

RnA—Rhoades-Daglum loams, 0 to 2 percent slopes. These deep, well drained, nearly level soils are on upland fans and terraces. The Rhoades soil is in pits. The Daglum soil is on slight rises. Areas are irregular in shape and 15 to 100 acres in size. They are 50 to 65 percent Rhoades soil and 20 to 35 percent Daglum soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Rhoades soil is grayish brown loam about 2 inches thick. The subsoil is about 26 inches of grayish brown, firm silty clay loam and silty clay. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light grayish brown, calcareous silty clay. It has nests of gypsum and other salts throughout. In places gravelly material is below a depth of 40 inches.

Typically, the surface layer of the Daglum soil is grayish brown loam about 6 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, firm clay loam about 30 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is olive gray, calcareous clay loam. It has nests of gypsum crystals and other salts throughout. In some areas gravelly material is below a depth of 40 inches.

Included with these soils in mapping are small areas of Slickspots. These inclusions make up less than 10 percent of any one mapped area. They have a dispersed surface and a high content of salts throughout. They generally do not support vegetation. They are in small pits.

The content of organic matter is moderate in the Rhoades and Daglum soils, and fertility is low. Tilth is poor. The sodium affected subsoil restricts the penetration of plant roots. Permeability is very slow. Available water capacity is low in the Rhoades soil and moderate in the Daglum soil. The shrink-swell potential is high in both soils. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Compaction is a major problem on the Rhoades soil. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The sodium affected subsoil is a limitation. Although the Daglum soil is suited to these uses, the use of the map unit is determined by the suitability of the Rhoades soil.

The Rhoades soil is in capability unit VIs-1, Thin Claypan range site, and windbreak suitability group 10; the Daglum soil is in capability unit IVs-2, Claypan range site, and windbreak suitability group 9.

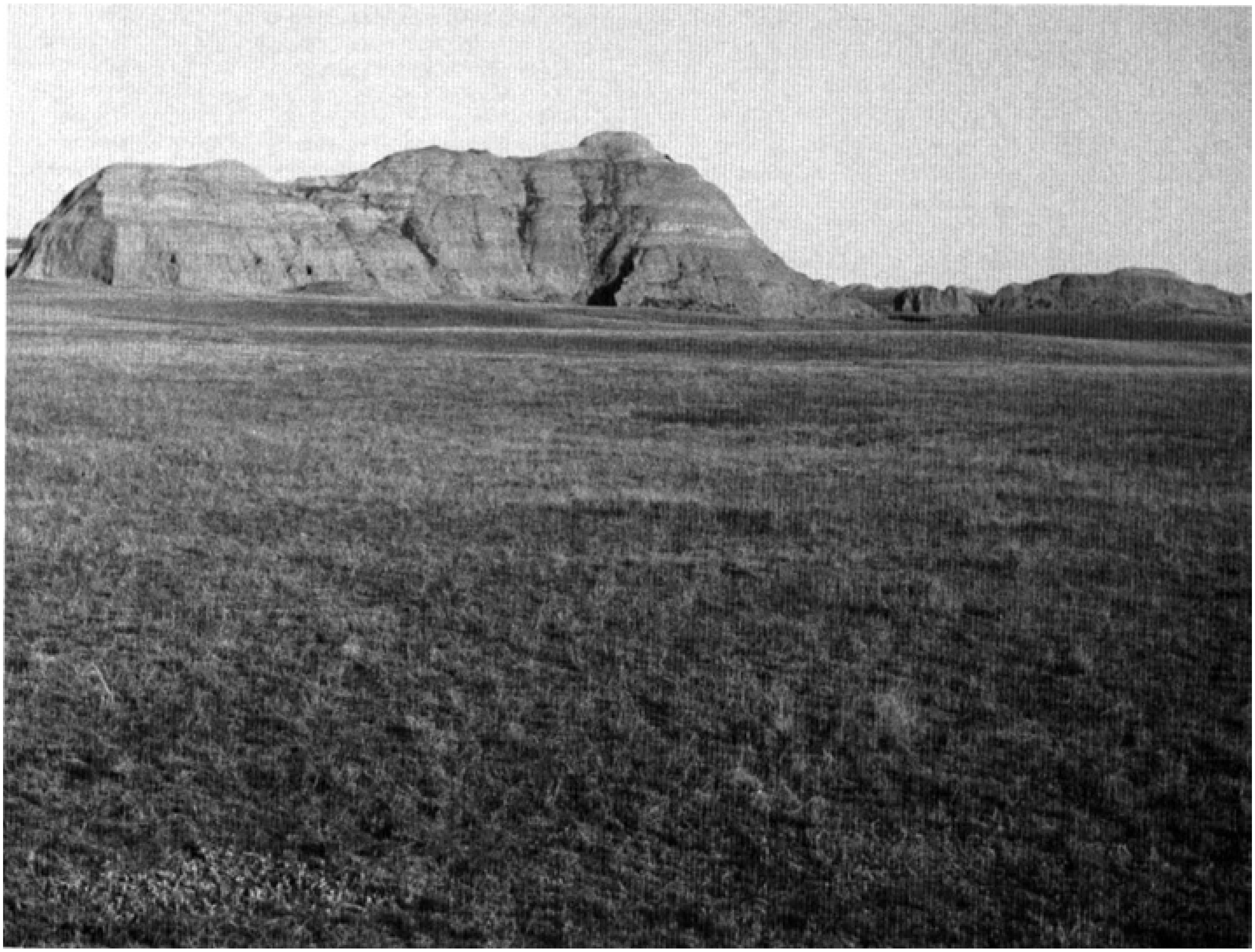

Figure 9.—An area of Rhame-Parchin fine sandy loams, 2 to 6 percent slopes, used as range. An area of Rock outcrop is in the background.

RnB—Rhoades-Daglum loams, 2 to 9 percent slopes. These moderately deep, well drained, undulating and moderately sloping soils are on uplands. The Rhoades soil generally is in small pits. The Daglum soil is on slight rises. Areas are irregular in shape and 15 to more than 120 acres in size. They are 45 to 55 percent Rhoades soil and 35 to 45 percent Daglum soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Rhoades soil is grayish brown loam about 2 inches thick. The subsoil is about 26 inches of grayish brown, firm silty clay and silty clay loam. In the lower part it is calcareous and has nests of gypsum crystals and other salts. Soft sandstone is at a depth of about 28 inches. In places the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Daglum soil is grayish brown loam about 6 inches thick. The next layer is light brownish gray loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, firm clay loam about 31 inches thick. It is calcareous and has nests of gypsum crystals and other salts throughout. Soft sandstone is at a depth of about 39 inches. In some areas the depth to bedrock is more than 40 inches.

Included with these soils in mapping are small areas of Amor, Cabba, Grail, and Reeder soils and Slickspots. These inclusions make up less than 20 percent of any one mapped area. Amor and Reeder soils are in the

convex areas slightly above the Daglum soil. They do not have a sodium affected subsoil. The shallow Cabba soils are on ridges. The deep Grail soils do not have a sodium affected subsoil. They are in swales. Slickspots have a dispersed surface and a high content of salts throughout. They generally do not support vegetation. They are in scattered small pits.

Fertility is low in the Rhoades and Daglum soils, and the content of organic matter is moderate. The sodium affected subsoil restricts the penetration of plant roots. Permeability is very slow. Available water capacity is low in the Rhoades soil and moderate in the Daglum soil. Runoff is medium on both soils. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem on the Rhoades soil. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The sodium affected subsoil is a limitation.

The Rhoades soil is in capability unit VIs-1 and Thin Claypan range site; the Daglum soil is in capability unit VIe-9 and Claypan range site; both soils are in windbreak suitability group 10.

RoF—Rock outcrop. This map unit consists of moderately steep to nearly vertical exposures of unweathered siltstone or sandstone bedrock that generally occurs as rimrock. Areas are irregular in shape and 10 to more than 60 acres in size.

Included with the Rock outcrop in mapping are small areas of Blackhall, Bullock, Cabbart, Glendive, and Parchin soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The shallow Blackhall and Cabbart soils are on ridges above the Rock outcrop. The sodium affected Bullock and Parchin soils generally are in small depressions below the Rock outcrop. The deep Glendive soils are along narrow drainageways. Slickspots have a dispersed surface and a high content of salts throughout. They do not support vegetation. They are in small pits near the Bullock soils.

Runoff is very rapid on the Rock outcrop. This map unit is subject to severe geologic erosion. It is unsuited to range, cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. Some areas of the included soils are used for limited grazing. Some areas provide shelter for wildlife and livestock.

The capability unit is VIIIs-1; no range site or windbreak suitability group is assigned.

RrF—Rock outcrop-Reva complex, 15 to 60 percent slopes. This map unit occurs as areas of Rock outcrop intermingled with areas of a well drained, shallow, moderately steep to very steep Reva soil. The unit is on uplands. The Rock outcrop is on high ridges and in areas of rimrock. The Reva soil is on narrow ridges above the rimrock. Areas are irregular in shape and 10 to more than 80 acres in size. They are 35 to 60 percent Rock outcrop and 30 to 50 percent Reva soil. The Rock outcrop and Reva soil occur as areas so closely intermingled or so small that mapping them separately is not practical.

The Rock outcrop is unweathered, hard, slightly fractured sandstone.

Typically, the surface layer of the Reva soil is light brownish gray, calcareous gravelly very fine sandy loam about 3 inches thick. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. White, hard sandstone is at a depth of about 16 inches.

Included with the Rock outcrop and Reva soil in mapping are areas of Cabba, Cabbart, Rockoa, Slimbutte, and Vanocker soils. These soils make up less than 25 percent of any one mapped area. The shallow Cabba and Cabbart soils are on ridges. They are 10 to 20 inches deep over soft bedrock. The deep Rockoa, Slimbutte, and Vanocker soils are on side slopes below the Reva soil.

The content of organic matter and fertility are low in the Reva soil. Permeability is moderately rapid. Available water capacity is very low. Runoff is rapid.

All areas of the Reva soil support native grasses and are used for grazing. Water erosion is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying. In some areas trees and shrubs provide limited protection for livestock and wildlife.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The Rock outcrop is an additional limitation.

The Rock outcrop is in capability unit VIIIs-1 and is not assigned to a range site or windbreak suitability group; the Reva soil is in capability unit VIIe-7, Shallow range site, and windbreak suitability group 10.

RsF—Rockoa-Reva complex, 6 to 60 percent slopes. These well drained, gently sloping to very steep soils are on uplands. The deep Rockoa soil is on side slopes below the Reva soil. The shallow Reva soil is on ridges. Areas are irregular in shape and 10 to 100 acres in size. They are 50 to 60 percent Rockoa soil and 20 to 30 percent Reva soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, about 2 inches of partially decomposed forest litter is at the surface of the Rockoa soil. The surface layer and subsurface layer have stones and channers. The surface layer is black loam about 2 inches thick. The subsurface layer is light gray loam about 3 inches thick. The next 2 inches is grayish brown very channery loam. The subsoil is about 14 inches of light gray and light brownish gray, friable very channery loam and very channery clay loam. The underlying material to a depth of 60 inches is white, calcareous very channery loam. In places hard bedrock is within a depth of 40 inches.

Typically, the surface layer of the Reva soil is light brownish gray, calcareous gravelly very fine sandy loam about 3 inches thick. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. White, hard sandstone is at a depth of about 16 inches. In some areas the bedrock is soft sandstone.

Included with these soils in mapping are small areas of Slimbutte, Vanocker, Watrous, and Werner soils and Rock outcrop. These inclusions make up less than 25 percent of any one mapped area. Slimbutte and Vanocker soils are on side slopes below the Rockoa soil. They are more than 40 inches deep over hard bedrock. The moderately deep Watrous and shallow Werner soils are on gentle slopes and generally are higher on the landscape than the Rockoa soil. Also, Watrous soils have a lighter colored surface layer. Rock outcrop occurs as vertical escarpments along areas of rimrock.

Fertility is low in the Rockoa and Reva soils. The content of organic matter is moderate in the Rockoa soil and low in the Reva soil. Permeability is moderate in the Rockoa soil and moderately rapid in the Reva soil. Available water capacity is low in the Rockoa soil and very low in the Reva soil. Runoff is rapid on both soils. The shrink-swell potential is low.

All of the acreage supports native vegetation and is used for timber or grazing. The Rockoa soil supports a sparse or moderate stand of ponderosa pine and a sparse stand of grasses. The slope of this soil hinders logging. Water erosion is a hazard unless an adequate plant cover is maintained. In places gullies form along logging and cattle trails. The trees on the Rockoa soil provide shelter and protection for wildlife and livestock.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Rockoa soil is in capability unit VIIe-9 and Cool Slopes grazable woodland group; the Reva soil is in capability unit VIIe-7 and Shallow range site; both soils are in windbreak suitability group 10.

SaA—Sage loam. This deep, nearly level, poorly drained soil is on flood plains. It is occasionally flooded for very brief periods. Areas are long and narrow and are 10 to 40 acres in size.

Typically, the surface layer is light brownish gray loam about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray and olive gray silty clay loam, silty clay, and clay. The soil has a high content of gypsum and other salts throughout. In some areas gravelly material is below a depth of 40 inches.

Included with this soil in mapping are small areas of Archin, Bullock, Glendive, Harlem, Havre, and Lallie soils. These soils make up less than 15 percent of any one mapped area. The sodium affected Archin and Bullock soils are in small depressions near the edges of the mapped areas. Glendive, Harlem, Havre, and Lallie soils have a lower content of salts throughout than the Sage soil. Glendive, Harlem, and Havre soils are on slight rises, and Lallie soils are in partially filled old channel meanders.

Organic matter content and fertility are low in the Sage soil. The high content of salts adversely affects the growth of most plants. Permeability is slow or very slow. Available water capacity is low. A seasonal high water table is within a depth of 2 feet. Runoff is slow. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing. An excess of salts and compaction are problems. Range management should favor salt tolerant species. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Many areas are potential sites for excavated ponds. The quality of the water generally is poor, however, because of the high content of salts.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the high content of salts.

The capability unit is VIIs-9; Saline Lowland range site; windbreak suitability group 10.

SbA—Sage-Hisle Variant complex, 0 to 2 percent slopes. These poorly drained, nearly level soils are on narrow flood plains. They are subject to rare flooding. The deep Sage soil is on the low parts of the flood plains, and the moderately deep Hisle Variant soil is on the high parts. Areas are irregular in shape and 10 to 100 acres in size. They are 60 to 70 percent Sage soil and 20 to 30 percent Hisle Variant soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Sage soil is light brownish gray silty clay loam about 5 inches thick. The underlying material is light brownish gray and olive gray silty clay loam, silty clay, and clay. Olive gray shale is at a depth of about 50 inches. The soil has a high content of gypsum and other salts throughout. In some areas the depth to shale is 20 to 40 inches.

Typically, the surface layer of the Hisle Variant soil is light gray silt loam about 1 inch thick. The subsoil is olive

gray and light olive gray, firm silty clay about 12 inches thick. It has nests of gypsum and other salts. It is mottled in the lower part. The underlying material is light gray, mottled silty clay. It has gypsum crystals and other salts throughout. Light olive gray shale is at a depth of about 38 inches. In some areas the underlying material is stratified sandy loam and loam.

Included with these soils in mapping are small areas of the well drained Hisle, Swanboy, and Twotop soils. These included soils make up less than 25 percent of any one mapped area. They are on the high parts of the flood plains.

The content of organic matter and fertility are low in the Sage and Hisle Variant soils. The high content of salts in the Sage soil adversely affects the growth of most plants. The sodium affected subsoil in the Hisle Variant soil restricts the penetration of plant roots. Permeability is slow or very slow in the Sage soil and very slow in the Hisle Variant soil. Available water capacity is low in both soils. A seasonal high water table is within a depth of 2 feet in the Sage soil and is at a depth of 1 to 2 feet in the Hisle Variant soil. Runoff is slow on both soils. The shrink-swell potential is very high.

All of the acreage supports native grasses and is used for grazing. An excess of salts and compaction are problems. Range management should favor salt tolerant species. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Many areas of the Sage soil are potential sites for excavated ponds. The quality of the water generally is poor, however, because of the high content of salts.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The high content of salts in the Sage soil and the sodium affected subsoil in the Hisle Variant soil are the main limitations.

The Sage soil is in capability unit VIIs-9, and the Hisle Variant soil is in capability unit VIw-4; both soils are in Saline Lowland range site and windbreak suitability group 10.

SgA—Savage silty clay loam. This deep, well drained, nearly level soil is on terraces. Areas are irregular in shape and 10 to 100 acres in size.

Typically, the surface layer is grayish brown silty clay loam about 6 inches thick. The subsoil is about 32 inches of grayish brown and light brownish gray, firm silty clay and silty clay loam. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray, calcareous silty clay. In places the subsoil contains less clay. In some areas gravelly material is below a depth of 40 inches. In other areas the soil is dark to a depth of more than 16 inches.

Included with this soil in mapping are small areas of Gerdrum soils on small flats and in small depressions. These soils have a sodium affected subsoil. They make up less than 10 percent of any one mapped area.

The content of organic matter is moderate in the Savage soil, and fertility is medium. Tilth is good. Permeability is moderately slow. Available water capacity is moderate or high. Runoff is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage and leaving crop residue on the surface.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIc-2; Clayey range site; windbreak suitability group 3.

ShB—Shambo loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on foot slopes and terraces. Areas are irregular in shape and 10 to more than 50 acres in size.

Typically, the surface layer is grayish brown loam about 5 inches thick. The subsoil is friable loam about 29 inches thick. It is grayish brown in the upper part and light yellowish brown and calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous loam and silt loam. In some places the soil is dark to a depth of more than 16 inches. In other places the subsoil contains more clay. In some areas gravelly material is below a depth of 40 inches.

Included with this soil in mapping are small areas of Daglum and Rhoades soils. These soils make up less than 15 percent of any one mapped area. They have a sodium affected subsoil. They are in small pits and depressions.

The content of organic matter is moderate and fertility medium in the Shambo soil. Permeability is moderate. Available water capacity is high. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that conserve moisture and control erosion are the main management needs in cultivated

areas. Examples are minimizing tillage and leaving crop residue on the surface. Contour farming, grassed waterways, and terraces also help to control erosion.

No major hazards affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIe-1; Silty range site; windbreak suitability group 3.

SmB—Shambo-Rhoades loams, 2 to 6 percent slopes. These deep, well drained, gently sloping soils are on terraces. The Shambo soil is on the convex parts of the landscape. The Rhoades soil is on the low side slopes. Areas are irregular in shape and 10 to more than 100 acres in size. They are 45 to 55 percent Shambo soil and 20 to 30 percent Rhoades soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Shambo soil is grayish brown loam about 5 inches thick. The subsoil is about 29 inches thick. It is grayish brown, friable loam in the upper part and light yellowish brown, friable, calcareous loam in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous loam and silt loam. In some areas the dark color extends below a depth of 16 inches. In other areas the slope is as much as 9 percent.

Typically, the surface layer of the Rhoades soil is grayish brown loam about 2 inches thick. The subsoil is grayish brown silty clay loam and silty clay about 26 inches thick. It is calcareous and has nests of gypsum and other salts in the lower part. The underlying material to a depth of 60 inches is light grayish brown, calcareous silty clay that has nests of gypsum and other salts throughout.

Included with these soils in mapping are small areas of Daglum and Parshall soils. These included soils make up less than 25 percent of any one mapped area. Daglum soils are in small depressions. Their surface layer is thicker than that of the Rhoades soil. Parshall soils are in swales. They are dark to a depth of more than 16 inches. Also, they have more sand throughout than the Shambo soil.

The content of organic matter is moderate in the Shambo and Rhoades soils. Fertility is medium in the Shambo soil and low in the Rhoades soil. The Rhoades soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is moderate in the Shambo soil and very slow in the Rhoades soil. Runoff is medium. The shrink-swell potential is moderate in the Shambo soil and high in the Rhoades soil.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of these soils for range; however, the Rhoades soil is subject to compaction. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Crop growth is severely restricted on the Rhoades soil because of the dense, sodium affected subsoil. Intermediate wheatgrass, crested wheatgrass, and alfalfa are examples of suitable pasture plants. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that control erosion, improve tilth, and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and contour farming. Chiseling or subsoiling improves tilth and increases the rate of water intake.

The Shambo soil is suited to windbreaks and environmental plantings, but the Rhoades soil generally is unsuited because of the sodium affected subsoil. Windbreaks can be established on the Shambo soil, but no trees or shrubs grow well on the Rhoades soil.

The Shambo soil is in capability unit IIe-1, Silty range site, and windbreak suitability group 3; the Rhoades soil is in capability unit VIs-1, Thin Claypan range site, and windbreak suitability group 10.

Sn—Slickspots. This map unit consists of nearly level, slightly depressional areas on terraces and uplands. Areas are irregular in shape and 10 to more than 60 acres in size. In some areas water is ponded after heavy rains and snowmelt.

The Slickspots have a puddled or slick surface. Visible accumulations of salts are at or near the surface. The soil material is massive clay loam. Weakly consolidated bedrock is at a depth of about 30 inches. This unit generally supports little or no vegetation, but it does support a sparse stand of weeds and pricklypear during wet periods.

Included with the Slickspots in mapping are small areas of Archin, Bullock, Daglum, Hisle, Parchin, Rhoades, and Swanboy soils. These soils make up less than 15 percent of any one mapped area. They support a sparse or moderate stand of grasses. Archin, Bullock, Daglum, Hisle, Parchin, and Rhoades soils have a sodium affected subsoil. They are on slight rises. Swanboy soils are near the edges of some mapped areas. They have a lower content of salts throughout than the Slickspots.

The Slickspots are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the high content of salts throughout.

The capability unit is VIIIs-3; no range site or windbreak suitability group is assigned.

SpC—Slimbutte-Arnegard-Reva complex, 2 to 12 percent slopes. These well drained, gently sloping to

strongly sloping soils are on uplands. The deep Slimbutte soil is on side slopes. It has scattered stones and boulders on the surface in some areas. The deep Arnegard soil is in narrow drainageways. The shallow Reva soil is on the upper side slopes and on ridges. Areas are irregular in shape and 10 to 50 acres in size. They are 40 to 50 percent Slimbutte soil, 25 to 35 percent Arnegard soil, and 20 to 30 percent Reva soil. The three soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Slimbutte soil is grayish brown very fine sandy loam about 5 inches thick. The subsoil is about 19 inches thick. It is gray, friable gravelly very fine sandy loam in the upper part and grayish brown and light brownish gray, very friable, calcareous very gravelly very fine sandy loam in the lower part. The upper part of the underlying material is light gray and white, calcareous very gravelly very fine sandy loam and very cobbly fine sandy loam. The lower part to a depth of 60 inches is white cobbles, stones, and pebbles.

Typically, the surface layer of the Arnegard soil is dark grayish brown loam about 9 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable loam about 35 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous loam. In some areas soft bedrock is at a depth of 25 to 40 inches.

Typically, the surface layer of the Reva soil is light brownish gray, calcareous gravelly very fine sandy loam about 3 inches thick. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. White, hard sandstone is at a depth of about 16 inches. In some areas the soil has more silt and clay and less gravel.

Included with these soils in mapping are small areas of Rockoa, Vanocker, and Watrous soils and Rock outcrop. These inclusions make up less than 25 percent of any one mapped area. Rockoa and Vanocker soils are in positions on the landscape similar to those of the Slimbutte soil. Their surface layer is not so dark as that of the Slimbutte soil. Watrous soils are on plateaus above the Slimbutte soil. They have more clay in the subsoil than the Slimbutte soil. Rock outcrop is on vertical escarpments, in areas of rimrock, and on ridges. It does not support vegetation.

The content of organic matter is moderate in the Slimbutte soil, high in the Arnegard soil, and low in the Reva soil. Fertility is medium in the Slimbutte soil, high in the Arnegard soil, and low in the Reva soil. Permeability is moderate in the upper part of the Slimbutte soil and moderately rapid in the lower part. It is moderate in the Arnegard soil and moderately rapid in the Reva soil. Available water capacity is low in the Slimbutte soil, high in the Arnegard soil, and very low in the Reva soil. Runoff is moderate or rapid on all three soils. The shrink-swell potential is low in the Slimbutte and Reva soils and moderate in the Arnegard soil.

Nearly all of the acreage supports native grasses and is used for grazing. Some areas support a sparse stand of ponderosa pine and deciduous trees and shrubs. These areas provide limited shelter for livestock and wildlife. Water erosion is a hazard. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying. Reestablishing vegetation is difficult.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. Pasture plants and environmental plantings, however, can be established on the Arnegard soil.

The Slimbutte soil is in capability unit VIe-1, Stony Hills range site, and windbreak suitability group 10; the Arnegard soil is in capability unit IIe-1, Silty range site, and windbreak suitability group 1; the Reva soil is in capability unit VIe-11, Shallow range site, and windbreak suitability group 10.

SrE—Slimbutte-Reva complex, 6 to 60 percent slopes. These well drained, moderately sloping to very steep soils are on uplands. The deep Slimbutte soil is on side slopes. The shallow Reva soil is on ridges. Areas are irregular in shape and 20 to 100 acres in size. They are 55 to 65 percent Slimbutte soil and 20 to 40 percent Reva soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Slimbutte soil is grayish brown very fine sandy loam about 5 inches thick. The subsoil is about 19 inches thick. It is gray, friable gravelly very fine sandy loam in the upper part and grayish brown and light brownish gray, very friable, calcareous very gravelly very fine sandy loam in the lower part. The upper part of the underlying material is gray and white, calcareous very gravelly very fine sandy loam and very cobbly fine sandy loam. The lower part to a depth of 60 inches is white cobbles, stones, and pebbles.

Typically, the surface layer of the Reva soil is light brownish gray, calcareous gravelly very fine sandy loam about 3 inches thick. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. White, hard sandstone is at a depth of about 16 inches.

Included with these soils in mapping are small areas of Rockoa, Vanocker, and Watrous soils and Rock outcrop. These inclusions make up less than 25 percent of any one mapped area. Rockoa soils contain more clay in the subsoil than the Slimbutte soil. They are on the high parts of the landscape. Vanocker soils are more than 40 inches deep over bedrock. They are on the steeper side slopes above the Slimbutte soil. Watrous soils are higher on the landscape than the Slimbutte soil. They are 20 to

40 inches deep over hard bedrock. Rock outcrop is on vertical escarpments, in areas of rimrock, and on ridges.

The content of organic matter is moderate in the Slimbutte soil and low in the Reva soil. Fertility is medium in the Slimbutte soil and low in the Reva soil. Permeability is moderate in the upper part of the Slimbutte soil and rapid in the lower part. It is moderately rapid in the Reva soil. Available water capacity is low in the Slimbutte soil and very low in the Reva soil. Runoff is rapid on both soils. The shrink-swell potential is moderate in the Slimbutte soil and low in the Reva soil.

Nearly all of the acreage supports native grasses and is used for grazing. Water erosion is a hazard. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying. Reestablishing vegetation is difficult. Some areas of the included Vanocker soils support a moderate stand of ponderosa pine and decidious trees, which provide limited protection for livestock and wildlife.

This map unit is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the slope of both soils and the shallow depth to bedrock in the Reva soil.

The capability unit is VIIe-9, and the windbreak suitability group is 10; the Slimbutte soil is in Stony Hills range site, and the Reva soil is in Shallow range site.

SwA—Swanboy clay, 0 to 9 percent slopes. This deep, well drained, nearly level to moderately sloping soil is on terraces and foot slopes. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape and 10 to 100 acres in size.

Typically, the surface layer is olive gray, calcareous clay about 2 inches thick. The subsoil is light olive gray, very firm, calcareous clay about 9 inches thick. It has nests of gypsum crystals and other salts in the lower part. The underlying material to a depth of 60 inches is pale olive and olive, calcareous clay. It has many nests of gypsum crystals and other salts throughout.

Included with this soil in mapping are small areas of Hisle and Sage soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Hisle soils have a sodium affected subsoil. They are in slight depressions. The poorly drained Sage soils are along narrow drainageways. They have a large content of salts. Slickspots are in scattered slightly depressional areas. They have a puddled surface and have accumulations of salts at or near the surface. They do not support vegetation.

The content of organic matter and fertility are low in the Swanboy soil. Tilth is very poor. Permeability is very slow. Available water capacity is low. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Reestablishing vegetation is difficult.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the very poor tilth and the high content of salts in the subsoil.

The capability unit is VIs-6; Dense Clay range site; windbreak suitability group 10.

SyA—Swanboy-Slickspots complex, 0 to 2 percent slopes. This map unit occurs as areas of a deep, well drained, nearly level Swanboy soil intermingled with Slickspots. The unit is on foot slopes and terraces. The Swanboy soil is on slight rises. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. The Slickspots are in slight depressions. Areas are irregular in shape and 10 to 140 acres in size. They are 50 to 60 percent Swanboy soil and 20 to 30 percent Slickspots. The Swanboy soil and Slickspots occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Swanboy soil is olive gray, calcareous clay about 2 inches thick. The subsoil is light olive gray, very firm, calcareous clay about 9 inches thick. It has nests of gypsum crystals and other salts in the lower part. The underlying material to a depth of 60 inches is pale olive and olive, calcareous clay. It has many nests of gypsum crystals and other salts throughout.

The Slickspots occur as slightly depressional, barren areas. They have a puddled or slick surface and have accumulations of salts at or near the surface. The soil material to a depth of about 60 inches is massive clay.

Included with the Swanboy soil and Slickspots in mapping are small areas of Hisle, Hisle Variant, Sage, Twotop, and Winler soils. These soils make up less than 25 percent of any one mapped area. Hisle and Hisle Variant soils have a sodium affected subsoil. They are on small flats. The poorly drained Sage soils are along narrow drainageways. Twotop and Winler soils are on the high parts of the landscape. Twotop soils have a lower content of salts than the Swanboy soil. Winler soils are 20 to 40 inches deep over shale.

The content of organic matter and fertility are low in the Swanboy soil. Tilth is very poor. Permeability is very slow. Available water capacity is low. Runoff is slow. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Slickspots generally support little or no vegetation, but they do support a sparse stand of weeds and pricklypear during wet periods.

This map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The very poor tilth and the high content of salts are limitations.

The Swanboy soil is in capability unit VIs-6, Dense Clay range site, and windbreak suitability group 10; the Slickspots are in capability unit VIIIs-3 and are not assigned to a range site or windbreak suitability group.

TnB—Tanna silty clay loam, 2 to 9 percent slopes. This moderately deep, well drained, gently sloping and moderately sloping soil is on uplands. In some areas scattered stones are on the surface. Areas are irregular in shape and 10 to 200 acres in size.

Typically, the surface layer is grayish brown silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. It is firm. It is grayish brown silty clay loam in the upper part and light brownish gray and light yellowish brown, calcareous silty clay loam and clay loam in the lower part. The underlying material is pale yellow, calcareous loam. Pale yellow, weakly consolidated sandstone is at a depth of about 36 inches. In places the depth to bedrock is more than 40 inches. In some areas the dark color extends to a depth of more than 16 inches.

Included with this soil in mapping are small areas of the sodium affected Gerdrum soils. These soils make up less than 15 percent of any one mapped area. They are on foot slopes.

The content of organic matter is moderate in the Tanna soil, and fertility is medium. Tilth is good. Permeability is slow. Available water capacity is low or moderate. The shrink-swell potential is high. Runoff is medium.

Most of the acreage supports native grasses and is used for grazing and hay. Generally, no major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Intermediate wheatgrass is an example of a suitable pasture plant. Spring wheat, winter wheat, oats, and alfalfa are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and farming on the contour.

This soil is suited to windbreaks and environmental plantings, but the moderate depth to bedrock is a limitation. Planting on the contour helps to control erosion.

The capability unit is IVe-3; Clayey range site; windbreak suitability group 4L.

ToA—Tanna-Gerdrum complex, 0 to 3 percent slopes. These well drained, nearly level soils are on uplands. The moderately deep Tanna soil is on the smoother parts of the landscape. The Gerdrum soil is in small depressions. Areas are irregular in shape and 20 to more than 100 acres in size. They are 40 to 55 percent Tanna soil and 30 to 40 percent Gerdrum soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Tanna soil is grayish brown silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. It is firm. It is grayish brown silty clay loam in the upper part and light brownish gray and light yellowish brown, calcareous silty clay loam and clay loam in the lower part. The underlying material is pale yellow, calcareous loam. Pale yellow, weakly consolidated sandstone is at a depth of about 36 inches. In places the subsoil contains less clay.

Typically, the surface layer of the Gerdrum soil is light brownish gray silt loam about 2 inches thick. The subsoil is grayish brown and light brownish gray, very firm silty clay about 34 inches thick. In the lower part it is calcareous and has nests of gypsum crystals and other salts. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. It has gypsum and other salts throughout. In places the surface layer is thicker.

Included with these soils in mapping are small areas of Rhoades and Savage soils. These included soils make up less than 15 percent of any one mapped area. Rhoades soils are in positions on the landscape similar to those of the Gerdrum soil. They have less clay in the subsoil than the Gerdrum soil. The deep Savage soils have a lower content of salts than the Gerdrum soil. They are slightly lower on the landscape than the Tanna soil.

The content of organic matter is moderate in the Tanna soil and low in the Gerdrum soil. Fertility is medium in the Tanna soil and low in the Gerdrum soil. Tilth is good in the Tanna soil and poor in the Gerdrum soil. The Gerdrum soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is slow in the Tanna soil and very slow in the Gerdrum soil. Available water capacity is low or moderate in both soils. Runoff is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem on the Gerdrum soil. Also, the sodium affected subsoil in this soil limits productivity. Restricted grazing during wet periods helps to prevent compaction and the deterioration of tilth.

These soils are suited to cultivated crops and to tame pasture and hay, but the sodium affected subsoil in the Gerdrum soil is a limitation. Crested wheatgrass and intermediate wheatgrass are examples of suitable pasture plants. Winter wheat, spring wheat, and oats are the main cultivated crops. Measures that conserve moisture and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including

grasses and legumes in the cropping system. Chiseling or subsoiling increases the rate of water intake and improves tilth.

These soils are suited to windbreaks and environmental plantings, but the moderate depth to bedrock in the Tanna soil and the sodium affected subsoil in the Gerdrum soil are limitations. Windbreaks can be established, but optimum growth is unlikely.

The Tanna soil is in capability unit IIIs-1, Clayey range site, and windbreak suitability group 4L; the Gerdrum soil is in capability unit IVs-2, Claypan range site, and windbreak suitability group 9.

ToC—Tanna-Rhoades complex, 2 to 9 percent slopes. These moderately deep, well drained, gently sloping and moderately sloping soils are on uplands. The Tanna soil is on smooth side slopes. The Rhoades soil is on foot slopes. Areas are irregular in shape and 10 to 75 acres in size. They are 55 to 65 percent Tanna soil and 25 to 35 percent Rhoades soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Tanna soil is grayish brown silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. It is firm. It is grayish brown silty clay loam in the upper part and light brownish gray and light yellowish brown, calcareous silty clay loam and clay loam in the lower part. The underlying material is pale yellow, calcareous loam. Pale yellow, weakly consolidated sandstone is at a depth of about 36 inches. In places the depth to bedrock is more than 40 inches. In some areas the subsoil contains less clay.

Typically, the surface layer of the Rhoades soil is grayish brown loam about 2 inches thick. The subsoil is about 30 inches of grayish brown, firm silty clay loam and silty clay. In the lower part it is calcareous and has nests of gypsum crystals and other salts. Soft sandstone is at a depth of about 32 inches.

Included with these soils in mapping are small areas of Amor and Daglum soils. These included soils make up less than 25 percent of any one mapped area. Amor soils are in positions on the landscape similar to those of the Tanna soil. They have less clay throughout than the Tanna soil. Daglum soils have a surface layer that is thicker than that of the Rhoades soil. They are intermingled in a random pattern with areas of the Rhoades soil.

The content of organic matter is moderate in the Tanna and Rhoades soils. Fertility is medium in the Tanna soil and low in the Rhoades soil. Tilth is good in the Tanna soil and poor in the Rhoades soil. The Rhoades soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is slow in the Tanna soil and very slow in the Rhoades soil. Available water capacity is low or moderate in the Tanna soil and low in the Rhoades soil. Runoff is medium on both soils.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Compaction is a problem, however, on the Rhoades soil. Proper stocking rates and timely deferment of grazing or rotation grazing help to prevent surface compaction and the deterioration of tilth.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Crop growth is severely restricted on the Rhoades soil because of the dense, sodium affected subsoil. Crested wheatgrass and intermediate wheatgrass are examples of suitable pasture plants. Crested wheatgrass should be grown only on the gentle slopes. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control erosion are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and farming on the contour. Chiseling or subsoiling improves tilth and increases the rate of water intake.

The Tanna soil is suited to windbreaks and environmental plantings, but the Rhoades soil is generally unsuited. The moderate depth to bedrock in both soils and the sodium affected subsoil in the Rhoades soil are limitations. Windbreaks can be established on the Tanna soil, but optimum growth is unlikely. No trees or shrubs grow well on the Rhoades soil. Planting on the contour helps to control erosion.

The Tanna soil is in capability unit IVe-3, Clayey range site, and windbreak suitability group 4L; the Rhoades soil is in capability unit VIs-1, Thin Claypan range site, and windbreak suitability group 10.

TrB—Trey loamy fine sand, 2 to 9 percent slopes. This moderately deep, well drained, gently sloping and moderately sloping soil is on uplands. Areas are irregular in shape and 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown loamy fine sand about 4 inches thick. The next 26 inches is grayish brown fine sand. Soft sandstone is at a depth of about 30 inches. In places the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of Bullock, Fleak, and Parchin soils and small areas of Dune land. These inclusions make up less than 15 percent of any one mapped area. The sodium affected Bullock and Parchin soils are in small pits and depressions. The shallow Fleak soils are on ridges. Dune land occurs as widely scattered areas where sandy material has been blown out of pits and redeposited as mounds. It does not support vegetation.

The content of organic matter and fertility are low in the Trey soil. Tilth is poor. Permeability is rapid. Available water capacity is low. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a hazard. Sand blowouts can form in overgrazed areas. Maintaining an

adequate plant cover helps to control wind erosion. Range seeding is needed on some sites.

This soil generally is unsuited to cultivated crops and to tame pasture and hay. Erosion is a severe hazard, and the low fertility and low available water capacity are limitations.

This soil is suited to environmental plantings, but only evergreen trees and shrubs can be successfully established. Planting the trees and shrubs directly in sod helps to control wind erosion.

The capability unit is VIe-10; Sands range site; windbreak suitability group 7.

TtC—Trey-Fleak loamy fine sands, 2 to 15 percent slopes. These gently sloping to moderately steep soils are on uplands. The well drained, moderately deep Trey soil is on side slopes. The excessively drained, shallow Fleak soil is on ridges. Areas are irregular in shape and 10 to 200 acres in size. They are 50 to 60 percent Trey soil and 15 to 25 percent Fleak soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Trey soil is dark grayish brown loamy fine sand about 4 inches thick. The next 26 inches is grayish brown fine sand. Soft sandstone is at a depth of about 30 inches. In places the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Fleak soil is grayish brown, calcareous loamy fine sand about 5 inches thick. The underlying material is grayish brown and light brownish gray, calcareous loamy fine sand. Soft sandstone is at a depth of about 16 inches. In places the soil is fine sandy loam throughout.

Included with these soils in mapping are small areas of Bullock, Parchin, and Twilight soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected Bullock and Parchin soils are on small flats and in small pits and depressions. Twilight soils are in positions on the landscape similar to those of the Trey soil. They contain more clay and less sand throughout than the Trey soil.

The content of organic matter and fertility are low in the Trey and Fleak soils. Permeability is rapid. Available water capacity is low in the Trey soil and very low in the Fleak soil. Runoff is medium on both soils.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a hazard. Sand blowouts can form in overgrazed areas. Maintaining an adequate plant cover helps to control wind erosion. Range seeding is needed in some areas.

These soils generally are unsuited to cultivated crops and to tame pasture and hay. Erosion is a severe hazard. The low fertility and low or very low available water capacity in both soils and the shallow depth to bedrock in the Fleak soil are limitations.

The Trey soil is suited to environmental plantings, but only evergreen trees and shrubs can be successfully established. Planting the trees and shrubs directly in sod helps to control wind erosion. No trees or shrubs grow well on the Fleak soil because of the slope and the shallow depth to bedrock.

The Trey soil is in capability unit VIe-10, Sands range site, and windbreak suitability group 7; the Fleak soil is in capability unit VIe-9, Shallow range site, and windbreak suitability group 10.

TvB—Trey-Parchin-Bullock complex, 2 to 9 percent slopes. These moderately deep, well drained, gently sloping and moderately sloping soils are on uplands. The Trey soil is on side slopes. The Parchin and Bullock soils are in pits and depressions. Areas are irregular in shape and 10 to 150 acres in size. They are 40 to 50 percent Trey soil, 25 to 35 percent Parchin soil, and 15 to 25 percent Bullock soil. The three soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Trey soil is dark grayish brown loamy fine sand about 4 inches thick. The next 26 inches is grayish brown fine sand. Soft sandstone is at a depth of about 30 inches. In places the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Parchin soil is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is light brownish gray fine sandy loam about 5 inches thick. The subsoil is about 18 inches thick. It is firm. The upper part is brown sandy clay loam. The lower part is grayish brown and light brownish gray, calcareous sandy clay loam and clay loam. It has nests of gypsum and other salts. The underlying material is light gray, calcareous sandy clay loam. It has nests of gypsum crystals and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches.

Typically, the surface layer of the Bullock soil is grayish brown and light brownish gray fine sandy loam about 4 inches thick. The subsoil is about 16 inches thick. It is firm. The upper part is grayish brown sandy clay loam. The lower part is light brownish gray and light gray, calcareous loam and clay loam. It has nests of gypsum and other salts. The underlying material is light olive gray, calcareous very fine sandy loam that has nests of gypsum crystals and other salts. Light gray sandstone is at a depth of about 29 inches. In places the subsoil contains more clay.

Included with these soils in mapping are small areas of Assinniboine, Blackhall, Chinook, Fleak, Rhame, and Twilight soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Assinniboine and Chinook soils are more than 40 inches deep over soft bedrock. They have more silt and clay throughout than the Trey soil. Also, they are lower on the landscape. Blackhall and Fleak soils are 10 to 20 inches deep over bedrock. They are on the high parts of the landscape. Rhame and Twilight soils have more silt and

clay throughout than the Trey soil. They are in positions on the landscape similar to those of the Trey soil.

The content of organic matter and fertility are low in the Trey, Parchin, and Bullock soils. Tilth is poor. The Parchin and Bullock soils have a sodium affected subsoil that restricts the penetration of plant roots. Permeability is rapid in the Trey soil and very slow in the Parchin and Bullock soils. Available water capacity is low in all three soils. Runoff is slow. The shrink-swell potential is low in the Trey soil and moderate in the Parchin and Bullock soils.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a hazard. Sand blowouts can form in overgrazed areas of the Trey soil. Compaction is a problem on the Bullock soil. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Reestablishing vegetation is difficult. Proper stocking rates and timely deferment of grazing help to maintain maximum productivity.

This map unit generally is unsuited to cultivated crops and to tame pasture and hay. Although the Parchin soil is suited to these uses, the use of the map unit is determined by the suitability of the Trey and Bullock soils. Erosion is a severe hazard on the Trey soil, and the sodium affected subsoil near the surface of the Bullock soil is a limitation.

This map unit is poorly suited to windbreaks and environmental plantings. Only evergreen trees and shrubs can be successfully established on the Trey soil. Planting the trees and shrubs directly in sod helps to control erosion on this soil. The sodium affected subsoil in the Parchin and Bullock soils is a limitation. Optimum growth is unlikely on the Parchin soil. No trees or shrubs grow well on the Bullock soil.

The Trey soil is in capability unit VIe-10, Sands range site, and windbreak suitability group 7; the Parchin is in capability unit IVe-12, Sandy range site, and windbreak suitability group 9; the Bullock soil is in capability unit VIs-3, Thin Claypan range site, and windbreak suitability group 10.

TwC—Twilight fine sandy loam, 6 to 9 percent slopes. This moderately deep, well drained, moderately sloping soil is on uplands. Areas are irregular in shape and 10 to 100 acres in size.

Typically, the surface layer is grayish brown fine sandy loam about 4 inches thick. The subsoil is about 18 inches of brown and yellowish brown, very friable fine sandy loam and sandy loam. The underlying material is light olive brown sandy loam. Soft sandstone is at a depth of about 30 inches. In some areas the surface layer and the upper part of the subsoil are dark. In other areas the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of Assinniboine, Blackhall, Bullock, Marmarth, and Parchin soils. These soils make up less than 15 percent of any one mapped area. Assinniboine and Marmarth soils have more clay in the subsoil than the Twilight soil. Assinniboine soils are on foot slopes. Marmarth soils are in positions on the landscape similar to those of the Twilight soil. The shallow Blackhall soils are on ridges. The sodium affected Bullock and Parchin soils are in small pits and depressions.

The content of organic matter and fertility are low in the Twilight soil. Permeability is moderately rapid. Available water capacity is low. Runoff is medium. The shrink-swell potential is low.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed.

This soil is suited to cultivated crops and to tame pasture and hay, but it is somewhat droughty. Intermediate wheatgrass is an example of a suitable pasture plant. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control wind erosion and conserve moisture are the main management needs. Examples are minimizing tillage, leaving crop residue on the surface, and contour stripcropping.

This soil is suited to windbreaks and environmental plantings, but it is droughty because of the moderate depth to bedrock. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control water erosion. Preparing the site for planting in the spring helps to control wind erosion.

The capability unit is IVe-7; Sandy range site; windbreak suitability group 6R.

TxE—Twilight-Blackhall fine sandy loams, 9 to 25 percent slopes. These well drained, strongly sloping and moderately steep soils are on uplands. The moderately deep Twilight soil is on side slopes. The shallow Blackhall soil is on ridges and the upper side slopes. Areas are irregular in shape and 10 to 500 acres in size. They are 50 to 60 percent Twilight soil and 20 to 30 percent Blackhall soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Twilight soil is grayish brown fine sandy loam about 4 inches thick. The subsoil is about 18 inches of brown and yellowish brown, very friable fine sandy loam and sandy loam. The underlying material is light olive brown sandy loam. Soft sandstone is at a depth of about 30 inches. In places the surface layer is dark. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Blackhall soil is light yellowish brown, calcareous fine sandy loam about 4 inches thick. The underlying material is pale yellow, calcareous fine sandy loam. Soft sandstone is at a depth of about 18 inches.

Included with these soils in mapping are small areas of Assinniboine, Bullock, Marmarth, and Parchin soils. These included soils make up less than 25 percent of any one mapped area. Assinniboine and Marmarth soils have more clay in the subsoil than the Twilight soil. Assinniboine soils are on foot slopes. Marmarth soils are in positions on the landscape similar to those of the Twilight soil. The sodium affected Bullock and Parchin soils are in small pits and depressions.

The content of organic matter and fertility are low in the Twilight and Blackhall soils. Permeability is moderately rapid in the Twilight soil and moderate in the Blackhall soil. Available water capacity is low in the Twilight soil and very low in the Blackhall soil. Runoff is medium on both soils.

Most of the acreage supports native grasses and is used for grazing. Water erosion and wind erosion are hazards unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

Because of the slope of both soils and the shallow depth to bedrock in the Blackhall soil, this map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The less sloping areas of the Twilight soil, however, can be seeded to tame pasture plants or used for environmental plantings.

The Twilight soil is in capability unit VIe-7, Sandy range site, and windbreak suitability group 6R; the Blackhall soil is in capability unit VIe-11, Shallow range site, and windbreak suitability group 10.

TyC—Twilight-Parchin fine sandy loams, 6 to 15 percent slopes. These moderately deep, moderately sloping and strongly sloping, well drained soils are on uplands. The Twilight soil is on smooth side slopes. The Parchin soil is on small flats. Areas are irregular in shape and 10 to more than 350 acres in size. They are 50 to 60 percent Twilight soil and 20 to 30 percent Parchin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Twilight soil is grayish brown fine sandy loam about 4 inches thick. The subsoil is about 18 inches of brown and yellowish brown, very friable fine sandy loam and sandy loam. The underlying material is light olive brown sandy loam. Soft sandstone is at a depth of about 30 inches. In places the surface layer is dark. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Parchin soil is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is light brownish gray fine sandy loam about 5 inches thick. The subsoil is about 18 inches thick. It is firm. It is brown sandy clay loam in the upper part and grayish brown and light brownish gray, calcareous sandy clay loam and clay loam in the lower part. The underlying material is light gray, calcareous sandy clay loam. It has nests of gypsum crystals and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches.

Included with these soils in mapping are small areas of Assinniboine, Blackhall, Bullock, and Marmarth soils. These included soils make up less than 25 percent of any one mapped area. Assinniboine and Marmarth soils have more clay in the subsoil than the Twilight soil. Assinniboine soils are on foot slopes, and Marmarth soils are on the low parts of the landscape. The shallow Blackhall soils are on ridges. Bullock soils have a sodium affected subsoil that is closer to the surface than that of the Parchin soil. They are in small pits and depressions on the smooth parts of the landscape.

The content of organic matter and fertility are low in the Twilight and Parchin soils. Permeability is moderately rapid in the Twilight soil and slow or very slow in the Parchin soil. Available water capacity is low in both soils. Runoff is medium. The shrink-swell potential is low in the Twilight soil and moderate in the subsoil of the Parchin soil.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a hazard unless an adequate plant cover is maintained. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

These soils generally are unsuited to cultivated crops and to tame pasture and hay. The slope is the main problem. Wind erosion on both soils and the sodium affected subsoil in the Parchin soil are additional problems.

This map unit is poorly suited to windbreaks and environmental plantings. The Twilight soil is droughty because of the moderate depth to bedrock. The sodium affected subsoil in the Parchin soil restricts the penetration of plant roots. Windbreaks can be established on the Twilight soil, but no trees or shrubs grow well on the Parchin soil.

The Twilight soil is in capability unit VIe-7 and windbreak suitability group 6R; the Parchin soil is in capability unit VIe-5 and windbreak suitability group 9; both soils are in Sandy range site.

TzA—Twotop clay, 0 to 3 percent slopes. This deep, nearly level, well drained soil is on terraces and upland fans. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape and 15 to 100 acres in size.

Typically, the surface layer is olive gray clay about 4 inches thick. The subsoil is olive gray, calcareous, firm clay about 26 inches thick. It has accumulations of carbonate and nests of gypsum crystals in the lower

part. The underlying material to a depth of 60 inches is olive gray and light olive gray, calcareous clay and silty clay. It has nests of gypsum and other salts throughout. In some areas salts are farther from the surface. In other areas they are closer to the surface.

Included with this soil in mapping are small areas of Hisle soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. The sodium affected Hisle soils are in slight depressions. Slickspots are in scattered slight depressions. They have a puddled surface and have accumulations of salts at or near the surface. They generally do not support vegetation.

The content of organic matter and fertility are low in the Twotop soil. Permeability is very slow. Available water capacity is low or moderate. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Reestablishing vegetation is difficult.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of very poor tilth.

The capability unit is VIs-6; Dense Clay range site; windbreak suitability group 10.

VaF—Vanocker-Reva complex, 6 to 60 percent slopes. These well drained, gently sloping to very steep soils are on uplands. The deep Vanocker soil is on side slopes. The shallow Reva soil is on ridges and in areas of rimrock. Scattered stones are on some of the ridges. Areas are irregular in shape and 20 to 150 acres in size. They are 40 to 55 percent Vanocker soil and 20 to 35 percent Reva soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, about 2 inches of forest litter is at the surface of the Vanocker soil. The surface layer is dark gray gravelly loam about 2 inches thick. The subsoil is about 20 inches thick. It is light olive gray gravelly loam in the upper part and light gray and white, calcareous gravelly loam and very gravelly loam in the lower part. The underlying material to a depth of 60 inches is white, calcareous very gravelly and very cobbly loam.

Typically, the surface layer of the Reva soil is light brownish gray, calcareous gravelly very fine sandy loam about 3 inches thick. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. White, hard sandstone is at a depth of about 16 inches. In some areas the bedrock is soft.

Included with these soils in mapping are small areas of Arnegard, Slimbutte, and Watrous soils. These included soils make up less than 25 percent of any one mapped area. Arnegard soils are dark to a depth of more than 16 inches. They are in swales. The deep Slimbutte soils are on low side slopes. The moderately deep, gently sloping Watrous soils are higher on the landscape than the Vanocker and Reva soils.

The content of organic matter and fertility are low in the Vanocker and Reva soils. Permeability is moderate in the Vanocker soil and moderately rapid in the Reva soil. Available water capacity is moderate in the Vanocker soil and very low in the Reva soil. Runoff is rapid on both soils. The shrink-swell potential is moderate in the Vanocker soil and low in the Reva soil.

All of the acreage supports native vegetation and is used for timber or grazing. The Vanocker soil supports a sparse or moderate stand of ponderosa pine and a sparse stand of grasses (fig. 10). Water erosion is a hazard unless an adequate plant cover is maintained. In places gullies form along logging and cattle trails. The trees on the Vanocker soil provide shelter and protection for wildlife and livestock.

The Vanocker soil is suited to timber, but the slope is a limitation. Most of the commercial logging occurs in the Short Pines area. The trees harvested in most areas of this soil are used locally for fenceposts and for poles in corrals.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Vanocker soil is in capability unit VIIe-9 and Cool Slopes grazable woodland group; the Reva soil is in capability unit VIIe-7 and Shallow range site; both soils are in windbreak suitability group 10.

VbB—Vebar fine sandy loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. Areas are irregular in shape and 10 to more than 75 acres in size.

Typically, the surface layer is dark grayish brown fine sandy loam about 7 inches thick. The subsoil is brown, light olive brown, and light brownish gray, very friable fine sandy loam. It is calcareous in the lower part. Light brownish gray and light gray, soft sandstone is at a depth of about 32 inches. In places the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of Cohagen and Parchin soils. These soils make up less than 15 percent of any one mapped area. The shallow Cohagen soils are on ridges. The sodium affected Parchin soils are in slight depressions and on low side slopes.

The content of organic matter and fertility are low in the Vebar soil. Tilth is fair. Permeability is moderately rapid. Available water capacity is low. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of this soil for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

Figure 10.—Trees on the Vanocker soil in an area of Vanocker-Reva complex, 6 to 60 percent slopes.

This soil is suited to cultivated crops and to tame pasture and hay, but it is somewhat droughty. Alfalfa, intermediate wheatgrass, and crested wheatgrass are examples of suitable pasture plants. Spring wheat, winter wheat, alfalfa, and barley are the main cultivated crops. Measures that control wind erosion and conserve moisture are the main management needs in cultivated areas. Examples are stripcropping, minimizing tillage, including grasses and legumes in the cropping system, and leaving crop residue on the surface. Establishing field windbreaks also helps to control wind erosion.

This soil is suited to windbreaks and environmental plantings. Optimum growth is unlikely, however, because the soil is droughty. Preparing the site for planting in the spring helps to control wind erosion. Planting on the contour helps to control water erosion.

The capability unit is IIIe-8; Sandy range site; windbreak suitability group 6R.

VcC—Vebar-Cohagen fine sandy loams, 6 to 9 percent slopes. These well drained, moderately sloping soils are on uplands. The moderately deep Vebar soil is on side slopes. The shallow Cohagen soil is on ridges. Areas are irregular in shape and 10 to 120 acres in size. They are 50 to 60 percent Vebar soil and 20 to 30 percent Cohagen soil. The two soils occur as areas so

closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Vebar soil is dark grayish brown fine sandy loam about 7 inches thick. The subsoil is brown, light olive brown, and light brownish gray, very friable fine sandy loam. It is calcareous in the lower part. Light brownish gray and light gray, soft sandstone is at a depth of about 32 inches. In places the depth to bedrock is more than 40 inches. In some areas the soil is dark to a depth of more than 16 inches.

Typically, the surface layer of the Cohagen soil is light brownish gray, calcareous fine sandy loam about 4 inches thick. The underlying material is light gray, calcareous fine sandy loam. Soft sandstone is at a depth of about 16 inches. In some areas the soil has more clay and less sand throughout.

Included with these soils in mapping are small areas of Amor, Bullock, and Parchin soils. These included soils make up less than 25 percent of any one mapped area. Amor soils have more silt and clay throughout than the Vebar soil. They are in positions on the landscape similar to those of the Vebar soil. The sodium affected Bullock and Parchin soils are in small pits and depressions on low side slopes.

The content of organic matter is moderate in the Vebar soil and low in the Cohagen soil. Fertility is medium in the Vebar soil and low in the Cohagen soil. Permeability is moderately rapid in both soils. Available water capacity is low in the Vebar soil and very low in the Cohagen soil. Runoff is medium on both soils.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Wind erosion is a hazard, however, if the range is overgrazed. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This map unit is poorly suited to cultivated crops and to tame pasture and hay because the Vebar soil is droughty and the Cohagen soil is shallow. Alfalfa and intermediate wheatgrass are examples of pasture plants that are suited to the Vebar soil. No cultivated crops or pasture plants are suited to the Cohagen soil. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control wind erosion are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, minimizing tillage, and leaving crop residue on the surface.

The Vebar soil is suited to windbreaks and environmental plantings, but the Cohagen soil generally is unsuited. The depth to bedrock in both soils is a limitation. Windbreaks can be established on the Vebar soil, but optimum growth is unlikely. No trees or shrubs grow well on the Cohagen soil. Planting on the contour helps to control water erosion. Preparing the site for planting in the spring helps to control wind erosion.

The Vebar soil is in capability unit IVe-8, Sandy range site, and windbreak suitability group 6R; the Cohagen soil is in capability unit VIe-10, Shallow range site, and windbreak suitability group 10.

VcD—Vebar-Cohagen fine sandy loams, 9 to 25 percent slopes. These well drained, strongly sloping and moderately steep soils are on uplands. The moderately deep Vebar soil is on low side slopes. The shallow Cohagen soil is on the upper side slopes and on ridges. Areas are irregular in shape and 10 to 150 acres in size. They are 40 to 50 percent Vebar soil and 25 to 40 percent Cohagen soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Vebar soil is dark grayish brown fine sandy loam about 7 inches thick. The subsoil is brown, light olive brown, and light brownish gray, very friable fine sandy loam. It is calcareous in the lower part. Light brownish gray and light gray, soft sandstone is at a depth of about 32 inches. In places the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Cohagen soil is light brownish gray, calcareous fine sandy loam about 4 inches thick. The underlying material is light gray, calcareous fine sandy loam. Soft sandstone is at a depth of about 16 inches.

Included with these soils in mapping are small areas of Amor, Bullock, and Parchin soils. These included soils make up less than 25 percent of any one mapped area. Amor soils have more silt and clay throughout than the Vebar soil. They are in positions on the landscape similar to those of the Vebar soil. The sodium affected Bullock and Parchin soils are in small pits and depressions on the low side slopes.

The content of organic matter is moderate in the Vebar soil and low in the Cohagen soil. Fertility is medium in the Vebar soil and low in the Cohagen soil. Permeability is moderately rapid in both soils. Available water capacity is low in the Vebar soil and very low in the Cohagen soil. Runoff is medium on both soils.

Most of the acreage supports native grasses and is used for grazing. Water erosion and wind erosion are hazards unless an adequate plant cover is maintained. Reestablishing vegetation is difficult. In places gullies form along cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

Because of the slope of both soils and the shallow depth to bedrock in the Cohagen soil, this map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The less sloping areas of the Vebar soil, however, can be seeded to tame pasture plants or used for environmental plantings.

The Vebar soil is in capability unit VIe-6, Sandy range site, and windbreak suitability group 6R; the Cohagen

soil is in capability unit VIe-10, Shallow range site, and windbreak suitability group 10.

WaB—Watrous-Werner loams, 2 to 6 percent slopes. These well drained, gently sloping soils are on uplands. The moderately deep Watrous soil is on side slopes. The shallow Werner soil is on ridges. Areas are irregular in shape and 10 to 130 acres in size. They are 50 to 60 percent Watrous soil and 25 to 35 percent Werner soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface soil of the Watrous soil is very dark grayish brown and dark grayish brown loam about 8 inches thick. The subsoil is about 15 inches thick. It is friable. It is dark grayish brown and light brownish gray loam and clay loam in the upper part and white, calcareous loam in the lower part. The underlying material is white, calcareous gravelly loam. Hard sandstone is at a depth of about 30 inches. In places the dark color extends to a depth of more than 16 inches. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Werner soil is grayish brown, calcareous loam about 6 inches thick. The next layer is light brownish gray, calcareous loam. White, calcareous sandstone is at a depth of about 13 inches. In some areas the surface layer is not so dark.

Included in with these soils in mapping are small areas of the deep Rockoa, Slimbutte, and Vanocker soils on side slopes. These included soils make up less than 25 percent of any one mapped area. Rockoa and Vanocker soils support a medium or dense stand of ponderosa pine.

The content of organic matter is moderate in the Watrous and Werner soils, and fertility is medium. Permeability is moderate. Available water capacity is low in the Watrous soil and very low in the Werner soil. Runoff is medium on both soils. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Crested wheatgrass and intermediate wheatgrass are examples of pasture plants that are suited to the Watrous soil. No pasture plants are suited to the shallow Werner soil. Spring wheat, winter wheat, and oats are the main cultivated crops. Measures that control erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system.

The Watrous soil is suited to windbreaks and environmental plantings, but the Werner soil generally is unsuited. The depth to bedrock in both soils is a limitation. Windbreaks can be established on the Watrous soil, but optimum growth is unlikely. No trees or shrubs grow well on the Werner soil.

The Watrous soil is in capability unit IIe-1, Silty range site, and windbreak suitability group 6R; the Werner soil is in capability unit VIe-11, Shallow range site, and windbreak suitability group 10.

WbB—Watrous-Rhoades loams, 2 to 6 percent slopes. These well drained, moderately deep, gently sloping soils are on uplands. The Watrous soil is on low knolls. The Rhoades soil is on small flats and in depressions. Areas are irregular in shape and 15 to 85 acres in size. They are 40 to 55 percent Watrous soil and 30 to 40 percent Rhoades soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface soil of the Watrous soil is very dark grayish brown and dark grayish brown loam about 8 inches thick. The subsoil is about 15 inches thick. It is friable. It is dark grayish brown and light brownish gray loam and clay loam in the upper part and white, calcareous loam in the lower part. The underlying material is white, calcareous loam. Hard sandstone is at a depth of about 30 inches. In places the dark color extends to a depth of more than 16 inches. In some areas the depth to bedrock is more than 40 inches.

Typically, the surface layer of the Rhoades soil is light olive brown loam about 1 inch thick. The subsoil is about 17 inches thick. It is very firm. It is olive brown silty clay loam in the upper part and yellowish brown and brownish yellow, calcareous silty clay and clay loam in the lower part. The underlying material is light yellowish brown, calcareous clay loam. Clayey shale is at a depth of about 27 inches. It is underlain by hard sandstone.

Included with these soils in mapping are small areas of Cabba Variant, Cohagen, and Daglum soils. These included soils make up less than 25 percent of any one mapped area. Cabba Variant soils are 10 to 20 inches deep over hard sandstone. They are on ridges. The shallow Cohagen soils have more sand and less clay throughout than the Watrous soil. They generally are on the steeper slopes below the Watrous and Rhoades soils. Daglum soils have a surface layer that is thicker than that of the Rhoades soil. Also, they are slightly higher on the landscape.

The content of organic matter is moderate in the Watrous and Rhoades soils. Fertility is medium in the Watrous soil and low in the Rhoades soil. The Rhoades soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is moderate in the Watrous soil and very slow in the Rhoades soil. Available water capacity is low in both soils. Runoff is medium.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of these soils for range; however, the Rhoades soil is subject to compaction. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth.

This map unit is poorly suited to cultivated crops and to tame pasture and hay. Crop growth is severely restricted on the Rhoades soil because of the dense, sodium affected subsoil. Crested wheatgrass and intermediate wheatgrass are examples of suitable pasture plants. Although the Watrous soil is suited to cultivated crops and to windbreaks and environmental plantings, the use of the map unit is determined by the suitability of the Rhoades soil.

The Watrous soil is in capability unit IIe-1, Silty range site, and windbreak suitability group 6R; the Rhoades soil is in capability unit VIs-1, Thin Claypan range site, and windbreak suitability group 10.

WdC—Werner-Reva complex, 3 to 9 percent slopes. These shallow, well drained, gently sloping and moderately sloping soils are on uplands. The Werner soil is on the low parts of the landscape, and the Reva soil is on the high parts. In some areas scattered stones and boulders are on the surface. Areas are irregular in shape and 10 to 60 acres in size. They are 40 to 50 percent Werner soil and 30 to 35 percent Reva soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Werner soil is grayish brown, calcareous loam about 6 inches thick. The next layer is light brownish gray, calcareous loam. White, calcareous sandstone is at a depth of about 13 inches. In places the depth to bedrock is more than 20 inches.

Typically, the surface layer of the Reva soil is light brownish gray, calcareous, gravelly very fine sandy loam about 3 inches thick. The underlying material is light brownish gray and white, calcareous very gravelly very fine sandy loam. White, hard sandstone is at a depth of about 16 inches.

Included with these soils in mapping are small areas of Rockoa, Vanocker, and Watrous soils and Rock outcrop. These inclusions make up less than 25 percent of any one mapped area. Rockoa and Vanocker soils are on pine-covered side slopes. The moderately deep Watrous soils are on the smooth parts of the landscape. Rock outcrop generally is hard sandstone near the edges of the mapped areas.

The content of organic matter is moderate in the Werner soil and low in the Reva soil. Fertility is medium in the Werner soil and low in the Reva soil. Permeability is moderate in the Werner soil and moderately rapid in the Reva soil. Available water capacity is very low in both soils. Runoff is medium. The shrink-swell potential is moderate in the Werner soil and low in the Reva soil.

All of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are too shallow for cultivated crops, tame pasture and hay, and windbreak and environmental plantings.

The capability unit is VIe-11; Shallow range site; windbreak suitability group 10.

WeC—Werner-Watrous loams, 2 to 9 percent slopes. These well drained, gently sloping and moderately sloping soils are on uplands. The shallow Werner soil is on ridges. The moderately deep Watrous soil is on side slopes. Areas are irregular in shape and 10 to more than 75 acres in size. They are 50 to 60 percent Werner soil and 20 to 30 percent Watrous soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Werner soil is grayish brown, calcareous loam about 6 inches thick. The next layer is light brownish gray, calcareous loam. White, calcareous sandstone is at a depth of about 13 inches. In places the surface layer is not so dark.

Typically, the surface soil of the Watrous soil is very dark grayish brown and dark grayish brown loam about 8 inches thick. The subsoil is about 15 inches thick. It is friable. It is dark grayish brown and light brownish gray loam and clay loam in the upper part and white, calcareous loam in the lower part. The underlying material is white, calcareous gravelly loam. Hard sandstone is at a depth of about 30 inches. In places the dark color extends to a depth of more than 16 inches. In some areas the depth to bedrock is more than 40 inches.

Included with these soils in mapping are small areas of the deep Rockoa, Slimbutte, and Vanocker soils on side slopes. These included soils make up less than 25 percent of any one mapped area. Rockoa and Vanocker soils support a medium or dense stand of ponderosa pine.

The content of organic matter is moderate in the Werner and Watrous soils, and fertility is medium. Permeability is moderate. Available water capacity is very low in the Werner soil and low in the Watrous soil. Runoff is medium on both soils. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing. Generally, no major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

Mainly because of the shallow depth to bedrock in the Werner soil, this map unit generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. Although the Watrous soil

is suited to these uses, the use of the map unit is determined by the suitability of the Werner soil.

The Werner soil is in capability unit VIe-11, Shallow range site, and windbreak suitability group 10; the Watrous soil is in capability unit IIe-1, Silty range site, and windbreak suitability group 6R.

WhB—Winler-Hisle complex, 0 to 9 percent slopes. These well drained, moderately deep, nearly level to moderately sloping soils are on uplands. When dry, the Winler soil is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are irregular in shape and 10 to 80 acres in size. They are 50 to 65 percent Winler soil and 25 to 45 percent Hisle soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Winler soil is grayish brown clay about 3 inches thick. The subsoil is grayish brown and light brownish gray, very firm clay about 13 inches thick. It has nests of gypsum crystals in the lower part. The underlying material is light brownish gray clay. It has nests of gypsum crystals and fragments of shale throughout. Shale is at a depth of about 25 inches. In places salts are in the upper part of the subsoil. In some areas the depth to shale is more than 40 inches.

Typically, the surface layer of the Hisle soil is gray silt loam about 1 inch thick. The subsoil is grayish brown and light olive gray, very firm clay about 21 inches thick. It has gypsum crystals in the lower part. The underlying material is olive gray clay. It has gypsum crystals and other salts throughout. Gray shale is at a depth of about 34 inches. In some areas the depth to shale is more than 40 inches.

Included with these soils in mapping are small areas of Lismas, Sage, and Swanboy soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. The shallow Lismas soils are on ridges. The poorly drained Sage soils are along narrow drainageways. The deep Swanboy soils have salts at or near the surface. They are on foot slopes. Slickspots are in slightly depressional areas. They have a puddled or slick surface. They generally do not support vegetation.

The content of organic matter and fertility are low in the Winler and Hisle soils. Tilth is poor. The Hisle soil has a sodium affected subsoil that restricts the penetration of plant roots. Permeability is very slow in both soils. Available water capacity is low in the Winler soil and very low or low in the Hisle soil. Runoff is medium on both soils. The shrink-swell potential is very high.

All of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Reestablishing vegetation is difficult.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The poor tilth in both soils and the sodium affected subsoil in the Hisle soil are limitations.

The Winler soil is in capability unit VIs-6 and Dense Clay range site; the Hisle soil is in capability unit VIs-3 and Thin Claypan range site; both soils are in windbreak suitability group 10.

WsC—Winler-Lismas clays, 2 to 15 percent slopes. These well drained, gently sloping to strongly sloping soils are on uplands. The moderately deep Winler soil is on side slopes. The shallow Lismas soil is on ridges. Areas are irregular in shape and 10 to more than 150 acres in size. They are 40 to 55 percent Winler soil and 20 to 35 percent Lismas soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Winler soil is grayish brown clay about 3 inches thick. The subsoil is grayish brown and light brownish gray, very firm clay about 13 inches thick. It has nests of gypsum crystals in the lower part. The underlying material is light brownish gray clay. It has nests of gypsum crystals and fragments of shale throughout. Shale is at a depth of about 25 inches. In places salts are at or near the surface. In some areas the depth to shale is more than 40 inches.

Typically, the surface layer of the Lismas soil is olive gray clay about 3 inches thick. The underlying material is olive gray clay. It has nests of gypsum crystals throughout. Olive shale is at a depth of about 15 inches. In places the depth to shale is more than 10 inches.

Included with these soils in mapping are small areas of Hisle, Sage, and Swanboy soils and Slickspots. These inclusions make up less than 25 percent of any one mapped area. The sodium affected Hisle soils and the deep Swanboy soils are on foot slopes. The poorly drained Sage soils are along narrow drainageways. Slickspots have a puddled or slick surface. They do not support vegetation. They generally are on low side slopes.

The content of organic matter and fertility are low in the Winler and Lismas soils. Tilth is poor. Permeability is very slow. Available water capacity is low in the Winler soil and very low in the Lismas soil. Runoff is rapid on both soils. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing. Compaction and erosion are problems. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth. Proper stocking rates and timely deferment of grazing or rotation grazing help to control erosion and maintain maximum productivity.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The slope and the poor tilth are

limitations. The shallow depth to shale in the Lismas soil also is a limitation.

The capability unit is VIe-4, and the windbreak suitability group is 10; the Winler soil is in Dense Clay range site, and the Lismas soil is in Shallow Dense Clay range site.

ZaB—Zeona loamy fine sand, 2 to 9 percent slopes. This deep, excessively drained, undulating and gently rolling soil is on uplands. Areas are irregular in shape and 10 to more than 100 acres in size.

Typically, the surface layer is dark grayish brown loamy fine sand about 3 inches thick. The underlying material to a depth of 60 inches is grayish brown. It is fine sand in the upper part and loamy fine sand in the lower part. In places soft bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Bullock, Fleak, and Parchin soils and Blownout land. These inclusions make up less than 15 percent of any one mapped area. The sodium affected Bullock and Parchin soils are in small pits and depressions. The shallow Fleak soils are on ridges. Blownout land consists of sand blowouts and recent deposits from the blowouts. They occur in a random pattern throughout some mapped areas.

The content of organic matter and fertility are low in the Zeona soil. Permeability is rapid. Available water capacity is low. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a severe hazard if the range is overgrazed. Reestablishing vegetation is difficult. Proper stocking rates and timely deferment of grazing or rotation grazing help to control wind erosion and maintain maximum productivity.

This soil generally is unsuited to cultivated crops and to tame pasture and hay. Wind erosion is a severe hazard, and the low available water capacity is a limitation.

This soil is suited to environmental plantings, but only evergreen trees and shrubs can be successfully established. Planting the trees and shrubs directly in sod helps to control erosion.

The capability unit is VIe-10; Sands range site; windbreak suitability group 7.

ZaD—Zeona loamy fine sand, 9 to 25 percent slopes. This deep, excessively drained, rolling and hilly soil is on uplands. Areas are irregular in shape and 10 to more than 130 acres in size.

Typically, the surface layer is dark grayish brown loamy fine sand about 3 inches thick. The underlying material to a depth of 60 inches is grayish brown. It is fine sand in the upper part and loamy fine sand in the lower part. In places soft bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Bullock, Fleak, and Parchin soils and Blownout land. These inclusions make up less than 15 percent of any one mapped area. The sodium affected Bullock and Parchin soils are in small pits and depressions on the low parts of the landscape. The shallow Fleak soils are on ridges. Blownout land consists of sand blowouts and recent deposits from the blowouts. They occur in a random pattern throughout some mapped areas.

The content of organic matter and fertility are low in the Zeona soil. Permeability is rapid. Available water capacity is low. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a severe hazard if the range is overgrazed. Reestablishing vegetation is difficult. Proper stocking rates and timely deferment of grazing or rotation grazing help to control wind erosion and maintain maximum productivity.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. Wind erosion is a severe hazard, and the low available water capacity is a limitation.

The capability unit is VIIe-3; Sands range site; windbreak suitability group 10.

ZbC—Zeona-Blownout land complex, 2 to 15 percent slopes. This map unit occurs as areas of a deep, excessively drained, undulating to rolling Zeona soil intermingled with Blownout land. The unit is on uplands. Areas are irregular in shape and 10 to 60 acres in size. They are 40 to 65 percent Zeona soil and 20 to 35 percent Blownout land. The Zeona soil and Blownout land occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Zeona soil is dark grayish brown loamy fine sand about 3 inches thick. The underlying material to a depth of 60 inches is grayish brown. It is fine sand in the upper part and loamy fine sand in the lower part. In places soft bedrock is at a depth of 20 to 40 inches.

The Blownout land occurs as areas where the wind has removed several feet of sandy material. In many areas the underlying bedrock has been exposed. This land does not support vegetation. It generally is several feet lower on the landscape than the surrounding Zeona soil.

Included with the Zeona soil and Blownout land in mapping are small areas of Fleak, Parchin, Rhame, and Twilight soils. These soils make up less than 20 percent of any one mapped area. The shallow Fleak soils are on ridges. The sodium affected Parchin soils are on the low parts of the landscape. The moderately deep Rhame and Twilight soils are in positions on the landscape similar to those of the Zeona soil.

The content of organic matter and fertility are low in the Zeona soil. Permeability is rapid. Available water capacity is low. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a severe hazard if the range is overgrazed. Reestablishing vegetation is difficult because of the severe erosion hazard. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity and keep the blowouts from increasing in size. The Blownout land can be restored to range if reclamation measures are applied. These measures include fencing, adding straw or manure, and deferring grazing until a stand of grasses is established. Land leveling is needed in some areas.

This map unit is unsuited to cultivated crops and to tame pasture and hay. Wind erosion is a very severe hazard.

The Zeona soil is suited to environmental plantings, but only evergreen trees and shrubs can be successfully established. Planting directly in sod helps to control erosion. Trees and shrubs do not grow well on the Blownout land unless reclamation measures are applied.

The Zeona soil is in capability unit VIe-10, Sands range site, and windbreak suitability group 7; the Blownout land is in capability unit VIIIs-1 and is not assigned to a range site or windbreak suitability group.

ZpB—Zeona-Parchin complex, 2 to 9 percent slopes. These undulating and gently rolling soils are on uplands. The deep, excessively drained Zeona soil is in convex areas. The moderately deep, well drained Parchin soil is in slight depressions. Areas are irregular in shape and 10 to more than 200 acres in size. They are 45 to 60 percent Zeona soil and 20 to 30 percent Parchin soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Zeona soil is dark grayish brown loamy fine sand about 3 inches thick. The underlying material to a depth of 60 inches is grayish brown. It is fine sand in the upper part and loamy fine sand in the lower part. In places soft bedrock is at a depth of 20 to 40 inches.

Typically, the surface layer of the Parchin soil is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is light grayish brown fine sandy loam about 5 inches thick. The subsoil is about 18 inches thick. It is firm. The upper part is brown sandy clay loam. The lower part is grayish brown and light brownish gray, calcareous sandy clay loam and clay loam. It has nests of gypsum crystals and other salts. The underlying material is light gray, calcareous sandy clay loam. It has nests of gypsum crystals and other salts throughout. Weakly consolidated sandstone is at a depth of about 34 inches. In some areas the depth to bedrock is more than 40 inches.

Included with these soils in mapping are small areas of Bullock, Marmarth, Rhame, and Twilight soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected Bullock soils have a surface layer that is thinner than that of the Parchin soil. They are in small pits and depressions. The moderately deep Marmarth, Rhame, and Twilight soils do not have a sodium affected subsoil. They are slightly higher on the landscape than the Parchin soil.

The content of organic matter is low in the Zeona soil and moderate in the Parchin soil. Fertility is low in the Zeona soil and medium in the Parchin soil. Permeability is rapid in the Zeona soil and slow or very slow in the Parchin soil. Available water capacity is low in both soils. Runoff is slow. The shrink-swell potential is low in the Zeona soil and moderate in the Parchin soil.

Most of the acreage supports native grasses and is used for grazing. Wind erosion is a severe hazard if the range is overgrazed. Reestablishing vegetation is difficult. Proper stocking rates and timely deferment of grazing or rotation grazing help to control wind erosion and maintain maximum productivity.

This map unit is generally unsuited to cultivated crops and to tame pasture and hay. Wind erosion is a very severe hazard. Also, the sodium affected subsoil in the Parchin soil is a limitation.

These soils are suited to environmental plantings, but only evergreen trees and shrubs can be successfully established on the Zeona soil. Planting directly in sod helps to control erosion. Trees and shrubs can be established on the Parchin soil, but optimum growth is unlikely.

The Zeona soil is in capability unit VIe-10, Sands range site, and windbreak suitability group 7; the Parchin soil is in capability unit IVe-12, Sandy range site, and windbreak suitability group 9.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the county are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown in the section "Interpretive Groups," which follows the tables at the back of this survey.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main cultivated crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 12 percent of the acreage in Harding County is used for tame pasture or hay or for cultivated crops. The acreage is about evenly divided between cultivated crops and tame pasture or hay. The major crops are winter wheat, spring wheat, oats, and alfalfa. Barley and grain sorghum also are grown (*6*). Alfalfa is harvested mainly for hay, and oats is grown as a cash crop and as livestock feed.

The potential of the soils in Harding County for increased crop production is good. About 137,000 acres of potentially good cropland is used as range and about 18,000 acres as tame pasture and hayland (*11*). In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the major management concerns on the cropland in the county.

Water erosion reduces productivity and results in sedimentation. It is a hazard on Amor, Boxwell, Eapa, Farnuf, Kyle, Marmarth, Reeder, Shambo, and other soils if the slope is more than about 2 percent. Productivity is reduced when the more fertile surface layer is lost and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging on soils that have a thin surface layer, such as Delridge soils. When erosion occurs, sediment rich in nutrients enters streams and lakes. Measures that control erosion minimize this pollution and help to preserve water quality for fish, wildlife, recreation, and municipal uses. They also reduce the amount of fertilizer needed in cropped areas by helping to prevent the removal of plant nutrients.

A cropping system that keeps a plant cover on the surface for extended periods holds soil losses to an amount that will not reduce the productive capacity of

the soils. If a plant cover cannot protect the soil, careful management of crop residue is essential. Minimizing tillage and leaving crop residue on the surface increase the infiltration rate, reduce the runoff rate, and help to control erosion. Conservation tillage is a form of noninversion tillage that retains protective amounts of crop residue on the surface throughout the year. It is effective in reducing soil losses on sloping land. It includes no-till, stubble mulching, and chemical fallow systems that provide for a minimum number of tillage operations.

Terraces and diversions reduce the length of slopes and the runoff rate and thus help to control erosion. They are most practical on deep, well drained soils that have long, smooth slopes, such as Eapa, Farnuf, and Shambo soils. Many areas are poorly suited to terraces and diversions because of short, irregular slopes. In some areas of soils, such as Amor, Tanna, Twilight, Marmarth, and Attewan soils, an unfavorable subsoil would be exposed in terrace channels. Grassed waterways are effective in controlling gully erosion.

Wind erosion is a slight or moderate hazard on many of the soils in the county. The hazard is especially severe on Assinniboine, Glenberg, Marmarth, Parchin, Vebar, and Twilight soils. If winds are strong and the soils are dry and not protected by a plant cover or surface mulch, wind erosion can damage these soils in a few hours. It can be controlled by an adequate cover of plants or crop residue, stripcropping, and tillage methods that keep the surface rough. Windbreaks of suitable trees and shrubs also are effective in controlling wind erosion.

Information about the measures that control erosion on each kind of soil is contained in the Technical Guide, available in the local office of the Soil Conservation Service.

Soil fertility helps to determine the yields that can be obtained from the soils. It can be improved by applying fertilizer and by including grasses and legumes in the cropping system. On all soils additions of fertilizer should be based on the results of soil tests, on the needs of the crops, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer needed.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous. If tilled when wet, Kyle and Tanna soils tend to be very hard and cloddy when dry. As a result of the cloddiness, preparing a good seedbed is difficult. These soils dry out slowly in the spring and cannot be easily tilled when dry. Tilth is poor in Gerdrum, Parchin, and other soils that have a claypan subsoil. Timely tillage, inclusion of grasses and legumes in the cropping system, and incorporation of crop residue into the soil improve tilth and increase the rate of water intake.

Field crops suited to the soils and climate of the county include small grain and row crops. Wheat and oats are the main small grain crops. Barley is grown on a lesser acreage. The main row crop is corn. Grain sorghum is grown on a small acreage. Nearly all of the corn is harvested for silage.

Most winter wheat is planted on land that is summer fallowed. The soils that are best suited to field crops are more than 40 inches deep over bedrock. Because of their landscape position, they receive additional moisture as runoff from the surrounding uplands. Soils that have a claypan subsoil, such as Daglum, Gerdrum, and Parchin soils, are better suited to early maturing small grain than to other crops. These soils tend to be droughty late in the growing season because the claypan subsoil restricts root penetration and the rate of water intake.

Pasture plants best suited to the climate and to most of the soils in the county include alfalfa, crested wheatgrass, and intermediate wheatgrass. Crested wheatgrass is well suited to soils that tend to be droughty, but it should not be planted in areas where the slope is more than 6 percent because erosion is a hazard. Pubescent wheatgrass also is suited to soils that tend to be droughty.

If the pasture is overgrazed, the desirable grasses lose vigor and die and usually are replaced by annual grasses and by weeds. Proper stocking rates, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition. Restricted grazing during wet periods helps to prevent compaction in areas of soils that have a clayey surface layer or a claypan subsoil.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely

to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*9*). These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-4.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the section "Interpretive Groups," which follows the tables at the back of this survey.

Rangeland

Rod Baumberger, range conservationist, Soil Conservation Service, helped prepare this section.

Rangeland supports native vegetation suitable for grazing or browsing. It includes areas where native vegetation has been reestablished. The vegetation consists mainly of grasses and grasslike plants, forbs, and shrubs. The amounts and kinds of native vegetation grown in any one area are determined by the soil, topography, climate, past use, and management.

Nearly all of Harding County was rangeland before the first permanent settlers arrived. Currently, about 88 percent of the county supports native vegetation. This rangeland supplies a major portion of the forage for the livestock in the county.

Approximately 95 percent of the farm and ranch income in the county is derived from the sale of livestock. Most of the ranches are cow-calf enterprises. Some are sheep and yearling enterprises, and some ranchers raise all three kinds of livestock. This practice permits greater flexibility in adjusting livestock numbers during periods of drought. The rangeland generally is grazed throughout the year. The forage provided by rangeland is supplemented by protein concentrates and hay in winter. It also is supplemented by pastures of tame grasses, such as crested wheatgrass and intermediate wheatgrass.

Harding County is part of the mixed grass prairie. The native vegetation is dominated by mid and short grasses and by forbs, but some tall grasses are interspersed with

these plants. This mixed grass prairie is made up of cool- and warm-season plants, which provide good-quality forage throughout the growing season. The cool-season plants grow mostly during April, May, and June and the warm-season plants during June, July, and August. The cool-season grasses may start growing again in September and October if autumn rainfall is adequate.

The native vegetation in some parts of the county is producing below its potential because of past misuse. The tall and some of the mid grasses have been replaced by short grasses. The result is a total reduction in the amount of available forage. In most cases, however, enough of the original plants remain for good grazing management to reestablish the more productive plants.

Range Sites and Condition Classes

Different kinds of soil vary in their capacity to produce native vegetation. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. Soils that produce approximately the same kinds, amounts, and proportions of native vegetation make up a range site. The potential native vegetation on a range site is the stabilized plant community that the site is capable of producing. It consists of the plants that were growing on the site when the region was settled. This plant community maintains itself and changes very little as long as the environment remains unchanged. The relationship between soils and vegetation was ascertained during this survey; thus range sites generally can be determined directly from the soil maps.

The plants within the native plant community are sometimes grouped as decreasers, increasers, or invaders, depending on their response to grazing pressure. *Decreasers* are plants that respond to overgrazing by decreasing in abundance. They generally are the most productive plants and the ones most preferred by the grazing animals. *Increasers* are plants that respond to grazing pressure, at least initially, by increasing in amount as the more desirable decreaser plants become less abundant. Increasers generally are less productive and less preferred by grazing animals. *Invaders* are plants that are not part of the original plant community but invade the plant community because of some kind of disturbance or continued overgrazing. Some invader plants have little value for grazing.

Because plants do not respond in the same manner to different influences, a plant may be a decreaser on some range sites but an increaser on others. A cool-season plant, for example, may be a decreaser if the range site is grazed only during the spring but would be an increaser if the same site were grazed only during the summer. The reverse would be true for the more preferred warm-season plants. Restricting grazing to the spring would cause the warm-season plants to increase in abundance, and restricting grazing to the summer would cause them to decrease.

Table 6 shows, for nearly every soil, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. *Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management maintains the capacity of the rangeland to produce forage for livestock and game animals and to provide wildlife habitat, water, and watershed protection. The primary objective of good range management is to keep the rangeland in excellent or good condition. The main management concern is responding to important changes in the plant community of a range site.

Range condition is determined by comparing the present vegetation on a range site with the potential native plant community for the site. Four range condition classes are recognized. The range site is in excellent condition if 76 to 100 percent of the present vegetation is the same kind as the potential native vegetation; in good condition if the percentage is 51 to 75; in fair condition if the percentage is 26 to 50; and in poor condition if the percentage is 25 or less. The potential production depends on the range site, the range condition, and the moisture available to plants during the growing season.

Measures that maintain or improve the range condition are needed on all of the rangeland in the county. They include proper stocking rates and rotation grazing or deferred grazing programs, which allow for the proper sequence of grazing and provide rest periods that maintain or improve the vigor of the key plants. Good range management also includes range seeding, fencing, and measures that provide water for livestock. Contour furrowing, pitting, deep chiseling, and other kinds of mechanical treatment are needed on some range sites.

The soils in the county are assigned to 17 different range sites. The names of those sites are Clayey, Clayey Overflow, Claypan, Closed Depression, Dense Clay, Loamy Overflow, Loamy Terrace, Saline Lowland, Sands, Sandy, Shallow, Shallow Dense Clay, Silty, Stony Hills, Thin Claypan, Thin Upland, and Very Shallow. The paragraphs that follow describe these range sites.

Clayey range site. The potential native vegetation on this site is mid and short prairie grasses interspersed with a variety of forbs and shrubs. Green needlegrass and western wheatgrass, which are cool-season grasses, make up about 65 percent of the vegetation. Warm-season grasses make up about 25 percent, as follows: blue grama, 15 percent, and buffalograss, 10 percent. Forbs, such as American vetch, scurfpea, yarrow, and green sagewort, make up the rest.

The major management concern on this site is maintaining the amount of the most productive grasses. Green needlegrass and western wheatgrass rapidly decrease in amount after continued overgrazing because the livestock prefer these plants. If overgrazing continues, these plants are replaced by buffalograss and blue grama. The amount of the most productive grasses can be increased or maintained by proper stocking rates. Other management practices include rotation grazing, deferred grazing, and a combination of contour furrowing or pitting and deferred grazing.

Clayey Overflow range site. The potential native vegetation on this site is an excellent stand of mid grasses. Cool-season grasses make up about 90 percent of the vegetation. Western wheatgrass is the major cool-season grass. Green needlegrass is of lesser extent. Warm-season grasses, such as buffalograss and blue grama, are in the understory. Forbs and woody species are not of major importance when the site is in excellent condition.

The major management concern on this site is maintaining the amount of the most productive grasses. After periods of overgrazing, the amount of western wheatgrass decreases and the amount of buffalograss, blue grama, and weeds increases. Japanese brome and cocklebur are common invaders. The amount of the most productive grasses can be increased or maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Claypan range site. The potential native vegetation on this site is a mixture of mid and short grasses. Western wheatgrass, the dominant cool-season grass, makes up about 40 percent of the vegetation. Needleandthread, green needlegrass, and prairie sandreed make up about 25 percent. Warm-season grasses, such as blue grama and buffalograss, make up about 25 percent. Forbs, such as green sagewort, broom snakeweed, and American vetch, and shrubs, such as sagebrush, make up the rest.

The major management concern on this site is maintaining the amount of the most productive grasses. After continued overgrazing, the amount of western wheatgrass, green needlegrass, and prairie sandreed decreases while the amount of forbs and of short grasses, such as blue grama and buffalograss, increases. Low forage production is the result. If overgrazing continues, much of the surface is bare, especially during dry cycles. Weeds are common during wet cycles. The amount of the most productive grasses can be maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Closed Depression range site. The potential native vegetation on this site is mid grasses. Western wheatgrass makes up about 90 percent of the vegetation. Sedges, rushes, and inland saltgrass make up the rest. On the wetter sites, the amount of western wheatgrass is lower and the amount of rushes, sedges, and inland saltgrass is higher.

The main management concern on this site is maintaining the amount of western wheatgrass. After continued overgrazing, this grass is replaced by rushes and weeds. The amount of western wheatgrass can be maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Dense Clay range site. The potential native vegetation on this site is mid prairie grasses interspersed with forbs. Cool-season grasses are western wheatgrass, which makes up 60 percent of the vegetation, and green needlegrass, which makes up about 30 percent. Forbs, such as wild onion and American vetch, make up about 10 percent. Short grasses, such as buffalograss and blue grama, do not grow on this site.

The major management concern on this site is maintaining the amount of green needlegrass and western wheatgrass. After continuous overgrazing, these grasses are replaced by unpalatable plants or much of the surface is bare. The bare areas are highly susceptible to erosion. The amount of green needlegrass and western wheatgrass can be maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Loamy Overflow range site. The potential native vegetation on this site is an excellent stand of tall and mid grasses. Big bluestem makes up about 40 percent of the vegetation. Other grasses are as follows: switchgrass, 5 percent; green needlegrass, 10 percent; little bluestem, 15 percent; and western wheatgrass, 20 percent. The site has a small amount of short grasses and sedges. Shrubs, such as leadplant and rose, generally are throughout the site. Scattered stands of

green ash, American elm, chokecherry, buffaloberry, and willow are adjacent to some streams.

The major management concern on this site is maintaining the amount of the most productive grasses. After periods of overgrazing, big bluestem, western wheatgrass, little bluestem, green needlegrass, and other mid grasses are replaced by blue grama, buffalograss, and weeds. Japanese brome and foxtail barley are common invaders. The amount of the most productive grasses can be increased or maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Loamy Terrace range site. The potential native vegetation on this site is a mixture of mid and tall grasses. Western wheatgrass and green needlegrass make up about 70 percent of the vegetation. Needleandthread and prairie sandreed make up about 20 percent. Blue grama, buffalograss, sedges, green sagewort, rose, big sagebrush, and silver sagebrush make up the rest.

The major management concern on this site is maintaining the amount of the most productive grasses. After continued overgrazing, the amount of western wheatgrass, green needlegrass, needleandthread, and prairie sandreed decreases while the amount of buffalograss, blue grama, forbs, and woody plants increases. The amount of the most productive grasses can be maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Saline Lowland range site. The potential native vegetation on this site is salt tolerant plants. Western wheatgrass makes up about 60 percent of the vegetation. Prairie cordgrass, inland saltgrass, blue grama, and alkali sacaton make up about 30 percent. Sedges and forbs make up the rest. In some areas prairie cordgrass makes up as much as 60 percent of the vegetation.

The major management concern on this site is maintaining the amount of the most productive grasses. After continued overgrazing, the amount of western wheatgrass, prairie cordgrass, and alkali sacaton decreases and inland saltgrass soon becomes the principal grass on the site. The amount of the most productive grasses can be maintained by proper stocking rates and by rotation grazing or deferred grazing.

Sands range site. The potential native vegetation on this site is mainly warm-season, tall and mid grasses. These grasses make up about 80 percent of the vegetation, as follows: little bluestem, 30 percent; sand bluestem, 20 percent; prairie sandreed, 20 percent; sand dropseed, 5 percent; and an understory of blue grama and sedges, 5 percent. Cool-season grasses, such as needleandthread and western wheatgrass, make up about 10 percent of the vegetation. Forbs and woody plants, such as leadplant, rose, and sand cherry, make up the rest.

The major management concern on this site is maintaining the amount of the most productive grasses. After continued overuse, the bluestems are replaced by sand dropseed and blue grama. If overuse continues, green sagewort and sandbur increase in amount or invade. In places, the surface is bare and the formation of blowouts is a severe hazard. The amount of the most productive grasses can be increased or maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Sandy range site. The potential native vegetation on this site is mixed prairie grasses, chiefly mid and tall grasses. Warm-season grasses, such as little bluestem, sand bluestem, big bluestem, blue grama, and prairie sandreed, make up about 40 percent of the vegetation. Cool-season grasses, such as needleandthread and western wheatgrass, make up about 30 percent. Forbs, such as scurfpea and green sagewort, make up the rest.

The major management concern on this site is maintaining the amount of the most productive grasses. After continuous overgrazing, the bluestems and prairie sandreed are replaced by needleandthread and western wheatgrass. If overgrazing continues, these grasses are replaced by sand dropseed, threadleaf sedge, and blue grama and by green sagewort, a common increaser. Low forage production is the result. The amount of the most productive grasses can be increased or maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Shallow range site. The potential native vegetation on this site is mixed prairie grasses. Warm-season grasses make up about 75 percent of the vegetation, as follows: little bluestem, 50 percent; sideoats grama, 10 percent; big bluestem, 5 percent; blue grama, 5 percent; and prairie sandreed, 5 percent. Cool-season grasses, such as needleandthread and western wheatgrass, make up about 10 percent of the vegetation. Other plants, such as sedges, forbs, and shrubs, make up the rest.

The major management concern on this site is maintaining the amount of the most productive grasses. After continued overgrazing, the amount of little bluestem and big bluestem decreases and the amount of needleandthread and sideoats grama increases. If overgrazing continues, sideoats grama and needleandthread are replaced by a sparse cover of sedges, blue grama, and weeds. The amount of the most productive grasses can be maintained or increased by proper stocking rates and by rotation grazing or timely deferment of grazing.

Shallow Dense Clay range site. The potential native vegetation on this site is mid prairie grasses interspersed with forbs. Cool-season grasses are western wheatgrass,

which makes up about 60 percent of the vegetation, and green needlegrass, which makes up about 20 percent. Sideoats grama makes up about 5 percent. Forbs, such as wild onion, American vetch, and wild parsley, make up the rest. Short grasses, such as blue grama and buffalograss, do not grow on this site.

The major management concern on this site is maintaining the amount of western wheatgrass and green needlegrass. After continued overgrazing, these grasses are replaced by unpalatable plants or much of the surface is bare. The bare areas are highly susceptible to erosion. The amount of green needlegrass and western wheatgrass can be maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Silty range site. The potential native vegetation on this site is mainly cool-season grasses, which make up about 65 percent of the vegetation. Green needlegrass and western wheatgrass are the major cool-season grasses. Needleandthread is of lesser extent. Warm-season grasses, such as little bluestem, prairie sandreed, buffalograss, and blue grama, make up about 25 percent of the vegetation. Shrubs and forbs, such as green sagewort, heath aster, yarrow, and Missouri goldenrod, make up the rest.

The major management concern on this site is maintaining the amount of the most productive grasses. After continued overuse, western wheatgrass, green needlegrass, and needleandthread are replaced by buffalograss and blue grama. Low productivity is the result. The amount of the most productive grasses can be increased or maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Stony Hills range site. The potential native vegetation on this site is a mixture of mid and tall, warm-season grasses. Big bluestem and little bluestem make up about 60 percent of the vegetation. Sideoats grama and prairie dropseed are of lesser extent. Sedges and mid, cool-season grasses, such as green needlegrass and western wheatgrass, make up about 25 percent. Bluegrass, blue grama, and junegrass are in the understory. Forbs, such as green sagewort, scurfpea, dotted gayfeather, and prairie-clover, and shrubs, such as leadplant, wild rose, and western snowberry, make up the rest of the vegetation.

The major management concern on this site is maintaining the amount of big bluestem and little bluestem. After continued overgrazing, these grasses are replaced by western wheatgrass, blue grama, and bluegrass. If overgrazing continues, western wheatgrass is replaced by sedges and by undesirable forbs and weedy grasses. The amount of the desirable grasses can be maintained or increased by proper stocking rates and by timely deferment of grazing or of rotation grazing.

Thin Claypan range site. The potential native vegetation on this site is a mixture of mid and short grasses. Short, warm-season grasses dominate the site. Blue grama makes up about 40 percent of the vegetation and buffalograss about 15 percent. Mid, cool-season grasses, such as western wheatgrass and needleandthread, make up about 30 percent. Forbs, such as green sagewort and broom snakeweed, and shrubs, such as pricklypear and sagebrush, make up the rest. In somewhat saline areas, inland saltgrass may make up about 10 percent of the vegetation and as much as 20 percent of the surface is bare.

The major management concern on this site is maintaining the amount of western wheatgrass and needleandthread. After continued overgrazing, these grasses are replaced by blue grama, buffalograss, and inland saltgrass. If overgrazing continues, much of the surface is bare, especially during dry cycles. Weeds are common during wet cycles. The amount of the desirable grasses can be maintained or increased by proper stocking rates and by timely deferment of grazing or rotation grazing.

Thin Upland range site. The potential native vegetation on this site is mixed prairie grasses. Western wheatgrass, prairie sandreed, sideoats grama, and little bluestem make up about 60 percent of the vegetation. Blue grama and threadleaf sedge make up about 30 percent. Woody plants and forbs, such as green sagewort, make up the rest.

The major management concern on this site is maintaining the amount of the most productive grasses. The amount of mid grasses, such as needleandthread, western wheatgrass, and little bluestem, decreases after periods of overgrazing. If overgrazing continues, sedges and blue grama dominate the site. Low productivity is the result. The amount of the most productive grasses can be increased or maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Very Shallow range site. The potential native vegetation on this site is mid and short grasses. The mid grasses make up about 60 percent of the vegetation, as follows: needleandthread, 25 percent; little bluestem, 25 percent; and sideoats grama, 10 percent. Short grasses, such as blue grama and hairy grama, make up about 20 percent. Sedges, such as threadleaf sedge, make up about 15 percent. Forbs, such as dotted gayfeather, blacksamson, and green sagewort, and shrubs, such as skunkbush and small soapweed, make up the rest.

The main management concern on this site is maintaining the amount of the most productive grasses. After periods of overgrazing, the site rapidly deteriorates to a stand of grama grasses, threadleaf sedge, and a few unpalatable forbs. If overgrazing continues, the short grasses thin out and much of the surface is bare. The bare areas are highly susceptible to erosion. The amount

of the most productive grasses can be increased or maintained by proper stocking rates and by timely deferment of grazing or rotation grazing.

Woodland Management and Productivity

Sheridan Dronen, forester, Soil Conservation Service, helped prepare this section.

Approximately 30,000 acres in Harding County is forest land. This land is mainly on the Slim Buttes, in the North and South Cave Hills, and in the East and West Short Pines. Ponderosa pine is the dominant tree species in these areas. Vanocker and Rockoa are the only forest soils in the county, although sparse stands of ponderosa pine are on Reva and Slimbutte soils and in draws associated with Cabba soils. Green ash, Rocky Mountain juniper, and chokecherry also grow in these draws.

Native trees and shrubs grow on the flood plains along the larger drainageways. The most common trees are cottonwood, green ash, boxelder, American elm, and willow. The most common shrubs are chokecherry and plum.

The early settlers valued the woody vegetation as a source of fuel and food. Currently, the areas of native trees and shrubs are used chiefly as wildlife habitat and grazable woodland. All of the forested areas support fair or good stands of grasses, forbs, and shrubs. A small acreage in the East and West Short Pines is logged.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excessive water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and

winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable plants are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are the depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. It applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced on a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some woodland can produce enough understory vegetation to support grazing by livestock or wildlife, or both, without damage to the trees. The quantity and quality of the understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the thickness and condition of the forest litter. The density of the canopy determines the amount of light that understory plants receive.

The woodland soils in Harding County have been assigned to the Cool Slopes grazable woodland group, which is the only grazable woodland group in the county. The potential native vegetation on these soils is dominantly ponderosa pine and lesser amounts of green ash and bur oak. Grasses, shrubs, and forbs make up most of the understory. Sedges and cool-season grasses, such as green needlegrass, western wheatgrass, and Virginia wildrye, are the major cool-season species. They make up about 30 percent of the vegetation. Warm-season grasses, such as little bluestem, make up about 25 percent. Forbs make up about 10 percent. Woody species make up the rest. The major shrubs are Saskatoon serviceberry, russet buffaloberry, creeping juniper, currant, chokecherry, and snowberry.

The major management concern is maintaining the productivity of both the canopy and the understory. As the canopy of ponderosa pine increases, the amount of mid grasses, such as western wheatgrass, green needlegrass, and little bluestem, decreases. The amount of Kentucky bluegrass, littleseed ricegrass, sedges, and various forbs and shrubs increases. As the canopy increases to 60 percent or more, the understory vegetation dies and is replaced by forest litter.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Grazing is extremely damaging to windbreaks and environmental plantings because the livestock compact the soil and remove the lower branches of the trees and shrubs. Removal of the lower branches reduces the effectiveness of the windbreaks. Grasses and weeds prevent maximum growth. Clean cultivation and applications of herbicide help to control weeds. Fallowing a year before planting helps to provide a reserve supply of moisture, which is needed before the seedlings can be established. On Assinniboine, Marmarth, Rhame, Twilight, Vebar, and other soils that are susceptible to wind erosion, preparing the site in the spring helps to control wind erosion during the winter.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on

measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens.

At the end of each description under the heading "Detailed Soil Map Units," the soils are assigned to windbreak suitability groups. A windbreak suitability group is a distinctive group of soils that supports trees and shrubs having similar growth and survival rates if weather conditions are normal and the windbreak is properly managed. The relationship between the soils and the growth of trees and shrubs was ascertained during this survey. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the growth of trees and shrubs. Soil reaction, salt content, and a seasonal high water table also are important. Detailed information about each group is provided in the Technical Guide, which is available in the local office of the Soil Conservation Service.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Wildlife Habitat

Connie M. Vicuna, biologist, Soil Conservation Service, helped prepare this section.

Harding County is suited primarily to rangeland wildlife habitat. Most of the county is used as range. Only 12 percent of the acreage is used for agricultural crops. Because of this land use pattern, much of the original character of the wildlife habitat has been maintained. Many of the original wildlife species still inhabit the county, though in less abundance. These species include antelope, mule deer, sharp-tailed grouse, sage grouse, prairie chicken, jackrabbit, and lark bunting and other grassland songbirds. Prairie dogs are abundant throughout the county. Common predators include coyote, fox, badger, raccoon, skunks, golden eagles, ferruginous hawks, bobcats, and rattlesnakes. Other species, such as white-tailed deer, ring-necked pheasant, and gray partridge, have benefited from the effects of windbreaks, cultivation, and other agricultural activities on the environment.

The woody habitat in this county is on flood plains along drainageways, in draws, in the North and South Cave Hills, on Table Mountain, on the Slim Buttes, and in the East and West Short Pines. While not abundant, these scattered areas of trees and shrubs are very important because they provide food or cover for many rangeland wildlife species during some part of the year. Magpies, porcupines, mink, and beaver inhabit these wooded areas.

Fishing is very limited in Harding County. The Little Missouri River and the North Fork of the Moreau River are permanent streams. The South Fork of the Grand River and the remaining streams flow intermittently. Stock ponds are abundant throughout the county. Some have been stocked for private fishing. Several small reservoirs have been stocked for public fishing.

The reservoirs and ponds provide nearly all of the wetland wildlife habitat available in the county. Waterfowl are abundant only during migration. The ponds also provide watering sites for many wildlife species.

Because of the topographic units that they represent and the similar capabilities of their soils to produce and maintain vegetation, soil associations provide some indication of the actual and potential distribution and density of wildlife and their habitat. The 16 associations in Harding County are described under the heading "General Soil Map Units."

Antelope and mule deer are throughout the county. Antelope are most abundant in the open and more nearly level areas of the Zeona-Trey and Bullock-Parchin associations. Mule deer frequent the steep areas, wooded draws, and forested areas that are characteristic of the Cabba-Amor-Rhoades, Cabbart-Rock outcrop-Delridge, Reva-Rockoa, and Cohagen-Rock outcrop associations. Sharp-tailed grouse are most abundant in areas with taller grasses, scattered shrubs, and some topographic relief. White-tailed deer frequent the cropland and woody areas on the river bottoms in the Hanley-Korchea-Glendive association and the wooded areas of Slim Buttes and East and West Short Pines in the Reva-Rockoa association. Sage grouse is a common species only where sagebrush is abundant.

Most of the associations in the county are suited only to rangeland wildlife habitat because various hazards or limitations seriously affect other kinds of wildlife habitat. These hazards or limitations include a low supply of available moisture and a severe hazard of erosion in areas of the Zeona-Trey and Swanboy associations, low fertility and a sodium affected subsoil in areas of the Bullock-Parchin association, and a shallow depth to bedrock in areas of the Cabbart-Rock outcrop-Delridge, Reva-Rockoa, and Cohagen-Rock outcrop associations.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing specific elements of wildlife habitat. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element. The element can be established, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element are very severe and that unsatisfactory results can be expected. Establishing, improving, or maintaining the element is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are wheat and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are crested wheatgrass, intermediate wheatgrass, and alfalfa.

Wild herbaceous plants are native grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama grasses.

Planted trees and shrubs require cultivation before and during establishment. They provide fruit, buds, twigs, bark, and foliage. Soil properties that affect the growth of trees and shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of these plants are green ash, Russian-olive, plum, chokecherry, Rocky Mountain juniper, and buffaloberry.

Native deciduous trees and woody understory produce nuts or other fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of deciduous trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, cottonwood, ash, willow, plum, and chokecherry.

Native coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Native shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are skunkbush sumac, gooseberry, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Information concerning the habitat elements needed to maintain a specific wildlife species can be obtained from the local office of the Soil Conservation Service or from the South Dakota Department of Game, Fish and Parks.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of

the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in

construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

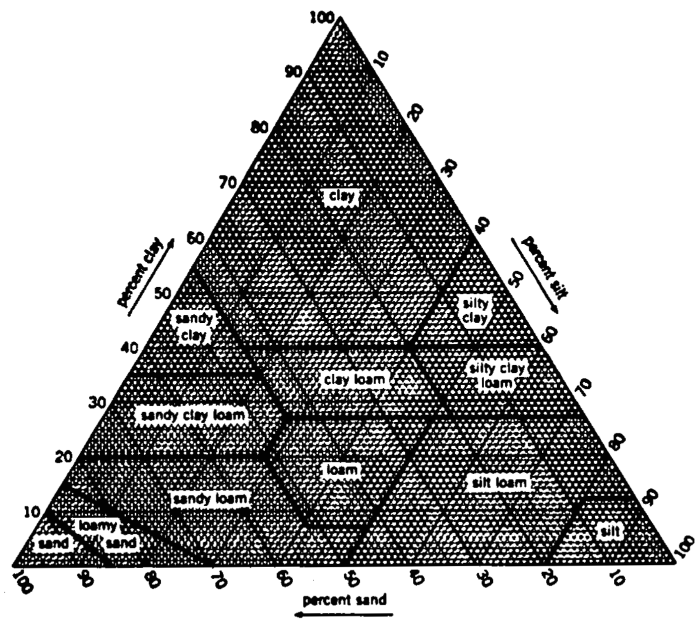

Figure 11.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 11). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of

grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 16, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as

low, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiborolls (*Argi*, meaning argillic horizon, plus *boroll*, the suborder of the Mollisols that has a cool temperature regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Argiborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed Typic Argiborolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in Harding County is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*8*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*10*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Amor Series

The Amor series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Permeability is moderate. Slopes range from 0 to 15 percent.

Typical pedon of Amor loam in an area of Amor-Cabba loams, 6 to 9 percent slopes, 2,340 feet south and 1,310 feet west of the northeast corner of sec. 24, T. 23 N., R. 4 E.

A1—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable; many fine roots; neutral; clear wavy boundary.

A2—4 to 8 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; soft, very friable; many fine roots; neutral; clear wavy boundary.

Bw1—8 to 13 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable; shiny films on faces of peds; common fine roots; neutral; clear wavy boundary.

Bw2—13 to 20 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak medium prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable; common fine roots; neutral; abrupt wavy boundary.

Bk1—20 to 27 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; hard, friable; few fine roots; many medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

Bk2—27 to 34 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; soft, very friable; few fine roots; many medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual irregular boundary.

Cr1—34 to 45 inches; light gray (2.5Y 7/1), soft sandstone, grayish brown (2.5Y 5/2) moist; few fine accumulations of carbonate; slight effervescence; moderately alkaline; clear wavy boundary.

Cr2—45 to 60 inches; light gray (2.5Y 7/2), soft sandstone, grayish brown (2.5Y 5/2) moist; slight effervescence; moderately alkaline.

The mollic epipedon ranges from 5 to 16 inches in thickness. It includes the A horizon and all or part of the Bw horizon. The depth to free carbonates ranges from 10 to 25 inches. The depth to soft bedrock ranges from 20 to 40 inches.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is 5 to 9 inches thick. The Bw horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 to 4. It is loam, sandy clay loam, or clay loam. Some pedons have a C horizon. The Cr horizon is dominantly soft sandstone or siltstone, but some pedons have layers of clayey shale or lignite a few inches to many feet thick.

Archin Series

The Archin series consists of deep, well drained soils formed in loamy alluvium on terraces and fans. Permeability is slow or very slow. Slopes range from 0 to 6 percent.

Typical pedon of Archin fine sandy loam, in an area of Archin-Bullock fine sandy loams, 0 to 4 percent slopes, 1,760 feet south and 1,050 feet west of the northeast corner of sec. 3, T. 20 N., R. 1 E.

A—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; many fine roots; slightly acid; clear wavy boundary.

E—4 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium platy structure parting to weak medium and fine subangular blocky; soft, very friable; common fine roots; slightly acid; abrupt wavy boundary.

Bt1—6 to 8 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium columnar structure parting to strong medium subangular blocky; extremely hard, firm, slightly sticky and plastic; light brownish gray (2.5Y 6/2) coatings on the tops of the columns; few fine compressed roots; shiny films on the faces of peds; slightly acid; clear wavy boundary.

Bt2—8 to 17 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; extremely hard, friable, sticky and plastic; common fine compressed roots; shiny films on faces of peds; slightly acid; abrupt wavy boundary.

Bkz—17 to 28 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate coarse and medium subangular blocky; very hard, friable, slightly sticky and plastic; very few fine roots; shiny films on faces of peds; common fine accumulations of carbonate; strong effervescence; common fine nests of gypsum crystals and other salts; moderately alkaline; gradual wavy boundary.

C1—28 to 48 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; very few fine roots; strong effervescence; strongly alkaline; diffuse wavy boundary.

C2—48 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and plastic; few fine roots; common very fine nests of gypsum crystals and other salts; strong effervescence; moderately alkaline.

The depth to free carbonates ranges from 12 to 30 inches. The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 1 to 4. It dominantly is fine sandy loam but in some pedons is very fine sandy loam or loam. It is 3 to 6 inches thick. The E horizon has

hue of 10YR or 2.5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 to 4. It is fine sandy loam, loamy fine sand, or loam. It is 2 to 8 inches thick.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is loam, sandy clay loam, or clay loam.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. It is loam or fine sandy loam stratified with coarser or finer textured material. It has few to many nests of gypsum crystals and other salts and accumulations of carbonate.

Arnegard Series

The Arnegard series consists of deep, well drained soils formed in local alluvium in swales and on foot slopes in the uplands. Permeability is moderate. Slopes range from 0 to 3 percent.

Typical pedon of Arnegard loam, 100 feet west and 20 feet south of the northeast corner of sec. 8, T. 22 N., R. 8 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, very friable; neutral; abrupt smooth boundary.

A—6 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable; neutral; clear wavy boundary.

Bw1—9 to 17 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse and medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable; neutral; clear wavy boundary.

Bw2—17 to 23 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; mildly alkaline; abrupt wavy boundary.

Bk1—23 to 31 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, friable; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Bk2—31 to 44 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; slightly hard, friable; few fine accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

C—44 to 60 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable; few fine accumulations of carbonate; strong effervescence; mildly alkaline.

The mollic epipedon ranges from 16 to 30 inches in thickness. It includes the A horizon and all or part of the Bw horizon. The depth to free carbonates typically ranges from 19 to 30 inches, but some pedons do not have free carbonates within a depth of 60 inches.

The A horizon has hue of 10YR, value of 3 or 4 (2 or 3 moist), and chroma of 2. It dominantly is loam but in some pedons is silt loam. It is 8 to 10 inches thick. The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 2 or 3. It is loam, silt loam, or clay loam. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It typically is loam or clay loam, but some pedons have thin lenses of silt loam, fine sandy loam, or loamy fine sand. Buried horizons are below a depth of 30 inches in some pedons.

Assinniboine Series

The Assinniboine series consists of deep, well drained soils formed in loamy and sandy material on terraces, fans, and uplands. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 0 to 6 percent.

Typical pedon of Assinniboine fine sandy loam, 3 to 6 percent slopes, 1,060 feet south and 550 feet west of the northeast corner of sec. 23, T. 20 N., R. 6 E.

A—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; many fine roots; neutral; clear wavy boundary.

Bt1—8 to 12 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; many fine roots; neutral; clear wavy boundary.

Bt2—12 to 18 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable; many fine roots; mildly alkaline; abrupt wavy boundary.

Bk1—18 to 23 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; common fine roots; common medium and fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Bk2—23 to 31 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, friable; common fine roots; few medium and fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Bk3—31 to 43 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; weak coarse subangular blocky structure; soft, friable; few fine roots; common medium and fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C—43 to 60 inches; grayish brown (2.5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; strong effervescence; moderately alkaline.

The depth to free carbonates ranges from 15 to 22 inches. The thickness of the mollic epipedon ranges from 7 to 15 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is 6 to 8 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 to 4. It is loam or sandy clay loam. The content of clay in this horizon is as low as 20 percent in some pedons and as high as 27 percent in others. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is fine sandy loam or loamy sand.

Attewan Series

The Attewan series consists of well drained soils formed in loamy alluvium on terraces and upland fans. These soils are moderately deep over sandy and gravelly material. Permeability is moderate in the upper part of the profile and rapid in the underlying material. Slopes range from 2 to 8 percent.

Typical pedon of Attewan loam, 2 to 6 percent slopes, 400 feet south and 140 feet west of the northeast corner of sec. 12, T. 20 N., R. 5 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; soft, very friable; many fine and medium roots; neutral; clear wavy boundary.

Bt1—5 to 12 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable; many fine and medium roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bt2—12 to 20 inches; grayish brown (2.5Y 5/2) loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable; common fine and few medium roots; shiny films on faces of peds; mildly alkaline; abrupt smooth boundary.

Bk—20 to 32 inches; grayish brown (2.5Y 5/2) sandy clay loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable; common fine and few medium roots; strong effervescence; mildly alkaline; clear wavy boundary.

2C—32 to 60 inches; light yellowish brown (2.5Y 6/4) very gravelly loamy sand, light olive brown (2.5Y 5/4) moist; single grain; loose; gravel partially coated with carbonates; thin layer of very gravelly loam in the lower part; violent effervescence; strongly alkaline.

The mollic epipedon ranges from 7 to 15 inches in thickness. It includes the A horizon and all or part of the B horizon. The depth to the gravelly underlying material ranges from 20 to 40 inches.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is 5 to 7 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 to 4. It is clay loam, sandy clay loam, or loam. The content of clay in this horizon is as low as 20 percent in some pedons and as high as 35 percent in others. Some pedons have a C horizon. The content of pebbles and cobble-sized rock fragments in this horizon is 35 to 90 percent.

Blackhall Series

The Blackhall series consists of shallow, well drained, calcareous soils formed in loamy residuum on uplands. Permeability is moderate. Slopes range from 9 to 25 percent.

These soils are at lower elevations and have a somewhat longer growing season than is definitive for the Blackhall series. These differences, however, do not significantly alter the usefulness or behavior of the soils.

Typical pedon of Blackhall fine sandy loam, in an area of Twilight-Blackhall fine sandy loams, 9 to 25 percent slopes, 1,300 feet east and 160 feet north of the southwest corner of sec. 27, T. 20 N., R. 6 E.

A—0 to 4 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; soft, very friable; many fine roots; slight effervescence; moderately alkaline; clear wavy boundary.

C—4 to 18 inches; pale yellow (2.5Y 7/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable; common fine roots; many fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cr1—18 to 29 inches; light gray (2.5Y 7/2), soft sandstone, grayish brown (2.5Y 5/2) moist; slight effervescence; moderately alkaline; abrupt wavy boundary.

Cr2—29 to 60 inches; pale yellow (2.5Y 7/4), soft sandstone, light olive brown (2.5Y 5/4) moist; strongly alkaline.

The depth to soft bedrock ranges from 10 to 20 inches. The depth to free carbonates ranges from 0 to 9 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 to 5 moist), and chroma of 2 to 4. It is 2 to 5 inches thick. Some pedons have an AC horizon. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is fine sandy loam or sandy loam. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 7 (2 to 5 moist), and chroma of 1 to 4. It typically is soft sandstone, but some pedons have layers of siltstone, clayey shale, or lignite a few inches to many feet thick.

Boxwell Series

The Boxwell series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Permeability is moderate. Slopes range from 6 to 9 percent.

Typical pedon of Boxwell loam, 6 to 9 percent slopes, 2,200 feet west and 600 feet south of the northeast corner of sec. 6, T. 19 N., R. 3 E.

A—0 to 7 inches; light olive brown (2.5Y 5/4) loam, very dark grayish brown (2.5Y 3/2) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, very friable; many fine roots; neutral; clear smooth boundary.

Bw—7 to 12 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable; common medium and fine roots; neutral; abrupt wavy boundary.

Bk1—12 to 23 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few medium and common fine roots; common fine accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

Bk2—23 to 31 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable; few fine and medium roots; common fine accumulations of carbonate; violent effervescence; moderately alkaline; gradual irregular boundary.

Cr—31 to 60 inches; pale olive (5Y 6/3), soft sandstone, olive (5Y 4/3) moist; horizontal bedding planes; few fine roots along cracks and seams in the bedrock; strong effervescence; moderately alkaline.

The depth to soft bedrock ranges from 20 to 40 inches. The depth to free carbonates ranges from 10 to 16 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 moist), and chroma of 2 to 4. It dominantly is loam but in some pedons is silt loam or very fine sandy loam. It is 4 to 8 inches thick. The Bw horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 3 or 4. It is loam or silt loam. The clay content in this horizon is as low as 20 percent in some pedons and as high as 27 percent in others. The bedrock typically is soft sandstone or siltstone, but it includes layers of clayey shale and lignite that range from 1 inch to many feet in thickness.

Bullock Series

The Bullock series consists of moderately deep, well drained, loamy soils formed in material weathered from soft sedimentary rocks. These soils are on uplands and terraces. Permeability is very slow. Slopes range from 0 to 20 percent.

Typical pedon of Bullock fine sandy loam, in an area of Bullock-Parchin-Slickspots complex, 2 to 9 percent slopes, 1,600 feet north and 750 feet east of the southwest corner of sec. 15, T. 16 N., R. 1 E.

E—0 to 4 inches; grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable; common fine roots; neutral; abrupt smooth boundary.

Bt—4 to 9 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; strong coarse columnar structure parting to strong coarse and medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; light gray (10YR 6/1) coatings on the tops of the peds; few fine compressed roots; shiny films on faces of peds; moderately alkaline; abrupt wavy boundary.

Btk—9 to 12 inches; light brownish gray (2.5Y 6/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, friable, slightly sticky and slightly plastic; few fine compressed roots; shiny films on faces of peds; many medium and coarse accumulations of carbonate; strong effervescence; few fine nests of gypsum crystals; moderately alkaline; clear wavy boundary.

Bkz1—12 to 15 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, friable, slightly sticky and slightly plastic; few fine compressed roots; common fine and medium accumulations of carbonate; strong effervescence; common fine nests of gypsum crystals and other salts; moderately alkaline; clear wavy boundary.

Bkz2—15 to 20 inches; light gray (2.5Y 6/1) clay loam, grayish brown (2.5Y 5/2) moist; weak fine and

medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine compressed roots; few fine accumulations of carbonate; strong effervescence; common fine nests of gypsum crystals and other salts; moderately alkaline; clear wavy boundary.

C—20 to 29 inches; light olive gray (5Y 6/2) very fine sandy loam, olive gray (5Y 5/2) moist; massive; hard, very friable; very few fine roots along horizontal bedding planes; few fine accumulations of carbonate; slight effervescence; common fine nests of gypsum crystals and other salts; moderately alkaline; clear wavy boundary.

Cr1—29 to 43 inches; light gray (2.5Y 6/1), soft sandstone, gray (2.5Y 5/1) moist; easily crushed; few fine roots in seams and cracks 2 to 7 inches apart in the bedrock; few fine accumulations of carbonate; moderately alkaline; clear wavy boundary.

Cr2—43 to 60 inches; light gray (2.5Y 6/1), soft sandstone, gray (2.5Y 5/1) moist; weakly consolidated; few fine roots along seams and cracks in the bedrock; few fine accumulations of carbonate; strongly alkaline.

The depth to carbonates, gypsum, and other visible salts ranges from 6 to 15 inches. The depth to bedrock ranges from 20 to more than 60 inches.

The E horizon has hue of 10YR or 2.5Y, value of 5 to 7 (3 or 4 moist), and chroma of 1 or 2. It is fine sandy loam or loamy sand. It is 2 to 4 inches thick.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is sandy clay loam, loam, or clay loam. Some pedons do not have free carbonates in the lower part of this horizon.

The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), chroma of 2 to 4. It is fine sandy loam, very fine sandy loam, loam, or clay loam. Some pedons do not have a C horizon.

The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 7 (2 to 5 moist), chroma of 1 to 4. It dominantly is soft sandstone, but some pedons have layers of soft clayey shale, siltstone, or lignite a few inches to many feet thick. Some layers do not have free carbonates.

The Bullock soils in the map units Archin-Bullock fine sandy loams, 0 to 4 percent slopes, and Bullock-Assinniboine fine sandy loams, 0 to 4 percent slopes, are taxadjuncts to the series because they do not have soft bedrock at a depth of 20 to 40 inches. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Cabba Series

The Cabba series consists of shallow, well drained soils formed in loamy residuum on uplands. Permeability is moderate. Slopes range from 6 to 25 percent.

Typical pedon of Cabba loam, in an area of Cabba-Lantry-Amor loams, 9 to 25 percent slopes, 2,000 feet south and 950 feet east of the northwest corner of sec. 12, T. 22 N., R. 7 E.

A—0 to 2 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, friable; many fine and medium roots; strong effervescence; mildly alkaline; abrupt smooth boundary.

Bk—2 to 8 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) loam, grayish brown (2.5Y 5/2) moist; moderate fine subangular blocky structure; slightly hard, friable; many medium roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C—8 to 15 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; slightly hard, friable; common olive yellow (2.5Y 6/8) concretions (iron and manganese oxides); strong effervescence; moderately alkaline; abrupt wavy boundary.

Cr1—15 to 50 inches; light gray (2.5Y 7/2), soft sandstone, light brownish gray (2.5Y 6/2) moist; very few fine roots along bedding planes; common olive yellow (2.5Y 6/8) stains on bedding planes (iron and manganese oxides); moderately alkaline; clear wavy boundary.

Cr2—50 to 60 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4), soft sandstone, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) moist; moderately alkaline.

The depth to bedrock ranges from 10 to 20 inches. The depth to carbonates ranges from 0 to 9 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 to 4. It dominantly is loam but in some pedons is silt loam. It is 2 to 4 inches thick. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. The Cr horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. It is weakly consolidated sandstone or siltstone that has layers of clayey shale or lignite a few inches to many feet thick.

Cabba Variant

The Cabba Variant consists of shallow, well drained soils formed in silty residuum on uplands. Permeability is moderate. Slopes range from 3 to 50 percent.

Typical pedon of Cabba Variant silty clay loam, in an area of Cohagen-Rock outcrop-Cabba Variant complex, 3 to 100 percent slopes, 1,625 feet west and 375 feet north of the southeast corner of sec. 35, T. 22 N., R. 4 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; soft, friable, sticky and plastic; many fine roots; strong effervescence; mildly alkaline; clear wavy boundary.
C1—3 to 10 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; soft, friable, sticky and plastic; common fine roots; strong effervescence; mildly alkaline; clear wavy boundary.
C2—10 to 14 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; slightly hard, friable, sticky and plastic; few fine roots; strong effervescence; moderately alkaline; abrupt wavy boundary.
C3—14 to 16 inches; multicolored (7.5YR 4/4, 2.5Y 6/4, and 10YR 2/2) silty clay loam, very dark brown (7.5YR 2/2) and olive brown (2.5Y 4/4) moist; hard, friable, sticky and plastic; few fine roots; slight effervescence; moderately alkaline; abrupt smooth boundary.
R—16 to 24 inches; white (10YR 8/1), hard sandstone, light yellowish brown moist; yellow (2.5Y 7/6) stains on the surface of cleavage planes (sulfur); strong effervescence on the surface of the bedrock, slight effervescence in the interior; neutral.

Hard bedrock is at a depth of 10 to 20 inches. Some pedons do not have free carbonates. The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 to 5 moist), and chroma of 1 to 4. It is dominantly silty clay loam but in some pedons is clay loam or silt loam. It is 2 to 4 inches thick. The C horizon has hue of 7.5YR to 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 6. The R horizon has a wide range of colors. It is hard siltstone or sandstone. Some layers are not calcareous.

Cabbart Series

The Cabbart series consists of shallow, well drained soils formed in loamy residuum on uplands. Permeability is moderate. Slopes range from 6 to 60 percent.

Typical pedon of Cabbart loam in an area of Cabbart-Delridge loams, 15 to 40 percent slopes, 1,750 feet east and 222 feet south of the northwest corner of sec. 15, T. 15 N., R. 1 E.

A—0 to 4 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak fine granular structure; soft, very friable; many fine roots; strong effervescence; mildly alkaline; clear smooth boundary.
Bk—4 to 11 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; weak fine granular structure; soft, very friable; many fine roots; 10 to 15 percent small fragments of soft sandstone; common medium and fine accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.
Cr1—11 to 19 inches; pale yellow (2.5Y 7/4), weakly consolidated sandstone, light yellowish brown (2.5Y 6/4) moist; common fine roots along bedding planes; strong effervescence; moderately alkaline; clear wavy boundary.
Cr2—19 to 26 inches; light yellowish brown (2.5Y 6/4), soft siltstone, light olive brown (2.5Y 5/4) moist; few compressed roots along bedding planes; coatings on bedding planes (iron and manganese oxides); slight effervescence; moderately alkaline; gradual irregular boundary.
Cr3—26 to 44 inches; pale olive (5Y 6/3) shale, olive (5Y 5/3) moist; many brownish yellow (10YR 6/6) mottles and dark coatings on bedding planes (iron and manganese oxides); moderately alkaline; clear irregular boundary.
Cr4—44 to 60 inches; pale olive (5Y 6/3), soft siltstone and weakly consolidated sandstone, olive (5Y 5/3) moist; many medium brownish yellow (10YR 6/6) stains and coatings on bedding planes (iron and manganese oxides); slight effervescence; moderately alkaline.

The depth to bedrock ranges from 10 to 20 inches. Some pedons do not have free carbonates in the upper 8 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 to 4. It is loam or silt loam. It is 2 to 4 inches thick. Some pedons have an AC horizon. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 7 (2 to 6 moist), and chroma of 2 to 4. It dominantly is weakly consolidated sandstone or siltstone but has layers of clayey shale a few inches to several feet thick. Some layers do not have free carbonates.

Chinook Series

The Chinook series consists of deep, well drained soils formed in loamy alluvial material on fans and terraces. Permeability is moderately rapid. Slopes range from 0 to 3 percent.

Typical pedon of Chinook fine sandy loam, in an area of Chinook-Archin fine sandy loams, 0 to 3 percent slopes, 450 feet east and 230 feet north of the southwest corner of sec. 20, T. 19 N., R. 4 E.

A—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure parting to weak medium subangular blocky; soft, very friable; many fine roots; neutral; abrupt smooth boundary.
Bw1—6 to 13 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; common fine roots; neutral; gradual smooth boundary.

Bw2—13 to 18 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, very friable; common fine roots; neutral; clear wavy boundary.

BC1—18 to 25 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, very friable; few fine roots; neutral; clear wavy boundary.

BC2—25 to 30 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; few fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C1—30 to 45 inches; light olive gray (5Y 6/2) fine sandy loam, olive gray (5Y 5/2) moist; massive; slightly hard, very friable; few fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—45 to 56 inches; light gray (5Y 7/2) fine sandy loam, light olive gray (5Y 6/2) moist; massive; slightly hard, very friable; few fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—56 to 60 inches; light olive gray (5Y 6/2) fine sandy loam, olive gray (5Y 5/2) moist; massive; slight effervescence; moderately alkaline.

The depth to free carbonates ranges from 12 to 35 inches. The thickness of the mollic epipedon ranges from 6 to 15 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It dominantly is fine sandy loam but in some pedons is sandy loam. It is 4 to 6 inches thick.

The Bw and BC horizons are fine sandy loam or sandy loam. The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 to 4. The BC horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. Some pedons have a Bk horizon.

The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is dominantly fine sandy loam or sandy loam but has strata of loamy sand or loam in some pedons. Buried horizons are below a depth of 30 inches in some pedons.

Cohagen Series

The Cohagen series consists of shallow, well drained soils formed in loamy residuum on uplands. Permeability is moderately rapid. Slopes range from 3 to 50 percent.

Typical pedon of Cohagen fine sandy loam, in an area of Vebar-Cohagen fine sandy loams, 9 to 25 percent slopes, 2,630 feet east and 2,440 feet south of the northwest corner of sec. 9, T. 21 N., R. 6 E.

A—0 to 4 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; many fine roots; strong effervescence; mildly alkaline; abrupt wavy boundary.

C1—4 to 9 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable; common fine roots; few fine fragments of soft sandstone; strong effervescence; mildly alkaline; clear wavy boundary.

C2—9 to 16 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; few fine roots; common fragments of soft sandstone; slight effervescence; mildly alkaline; gradual wavy boundary.

Cr1—16 to 26 inches; light gray (10YR 7/2), soft sandstone, light brownish gray (10YR 6/2) moist; few fine roots along cracks and seams in the bedrock; few brownish yellow (10YR 6/6) streaks (iron and manganese oxides) on bedding surfaces; moderately alkaline; clear wavy boundary.

Cr2—26 to 38 inches; light gray (10YR 7/2), soft sandstone, light brownish gray (10YR 6/2) moist; very few fine roots along seams and bedding planes; mildly alkaline; clear wavy boundary.

Cr3—38 to 60 inches; light gray (10YR 7/2), soft siltstone, light brownish gray (10YR 6/2) moist; few brownish yellow (10YR 6/6) and reddish brown (5YR 4/3) streaks (iron and manganese oxides) on bedding planes; few fine nests of gypsum crystals; mildly alkaline.

The depth to bedrock ranges from 10 to 20 inches. The depth to carbonates ranges from 0 to 9 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 to 4. It dominantly is fine sandy loam but in some pedons is sandy loam or loam. It is 3 to 6 inches thick. Some pedons have an AC horizon. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is fine sandy loam or sandy loam. Some layers are not calcareous. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7 (3 to 6 moist), and chroma of 2 to 4. It is soft sandstone that has layers of siltstone, clayey shale, or lignite a few inches to many feet thick. Some layers are not calcareous.

Daglum Series

The Daglum series consists of deep, well drained soils formed in alluvium on terraces, foot slopes, and side

slopes. Permeability is very slow. Slopes range from 0 to 9 percent.

Typical pedon of Daglum loam, in an area of Rhoades-Daglum loams, 0 to 2 percent slopes, 2,500 feet north and 200 feet west of the southeast corner of sec. 9, T. 21 N., R. 8 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; soft, friable; many fine roots; slightly acid; clear wavy boundary.

E—6 to 8 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak thin and medium platy structure parting to weak fine granular; slightly hard, friable; many fine roots; slightly acid; clear wavy boundary.

Bt1—8 to 13 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium columnar structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common fine compressed roots; shiny films on faces of peds; light brownish gray (10YR 6/2) coatings on the tops of the columns; mildly alkaline; clear wavy boundary.

Bt2—13 to 19 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few fine compressed roots; shiny films on faces of peds; moderately alkaline; abrupt wavy boundary.

Bkz—19 to 38 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; very hard, firm, sticky and plastic; very few fine compressed roots; common fine accumulations of carbonate; strong effervescence; many medium and fine nests of gypsum crystals and other salts; mildly alkaline; gradual wavy boundary.

C—38 to 60 inches; olive gray (5Y 5/2) clay loam, olive gray (5Y 4/2) moist; massive; hard, friable, sticky and plastic; strong effervescence; few fine nests of gypsum crystals and other salts; moderately alkaline.

The depth to carbonates ranges from 13 to 22 inches. The depth to nests of gypsum crystals ranges from 16 to 24 inches. Some pedons have bedrock below a depth of 40 inches.

The A and E horizons are loam or silt loam. The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 2. It is 4 to 8 inches thick. The E horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 1 or 2. It is 2 to 5 inches thick.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It is clay loam, silty clay loam, silty clay, or clay. The content of clay in this horizon is as low as 35 percent in some pedons and as high as 50 percent in others. The lower part of this horizon has visible salt crystals in some pedons.

The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 to 4. It is clay loam, silty clay, or clay. In some pedons buried horizons are below a depth of 40 inches.

The Daglum soil in the map unit Rhoades-Daglum loams, 2 to 9 percent slopes, is a taxadjunct to the series because it has soft bedrock at a depth of 20 to 40 inches. This difference, however, does not significantly alter the usefulness or behavior of the soil.

Delridge Series

The Delridge series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Peremability is moderate. Slopes range from 6 to 40 percent.

Typical pedon of Delridge loam, in an area of Delridge-Cabbart loams, 6 to 15 percent slopes, 1,600 feet south and 800 feet east of the northwest corner of sec. 25, T. 22 N., R. 1 E.

A—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium and coarse granular structure parting to weak fine granular; slightly hard, friable; many fine roots; neutral; clear wavy boundary.

Bk—5 to 15 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; many fine roots; many fine accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

C—15 to 25 inches; light brownish gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable; few fine roots; strong effervescence; mildly alkaline; clear wavy boundary.

Cr1—25 to 45 inches; light gray (5Y 7/2), weakly consolidated sandstone, grayish brown (2.5Y 5/2) moist; few fine roots along bedding planes; few coarse accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cr2—45 to 60 inches; light brownish gray (2.5Y 6/2), weakly consolidated sandstone, dark grayish brown (2.5Y 4/2) moist; few light yellowish brown (2.5Y 6/4) stains along bedding planes; moderately alkaline.

The depth to bedrock ranges from 20 to 40 inches. The depth to carbonates ranges from 0 to 5 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 to 4. It dominantly is loam but in some pedons is very fine sandy loam or clay loam. It is 2 to 5 inches thick. Some pedons have an AC or Bw horizon. The C horizon has hue of 10YR or 2.5Y,

value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is loam, silt loam, very fine sandy loam, or clay loam. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is soft sandstone, siltstone, or loamy shale. Some layers of the bedrock are not calcareous.

Dogiecreek Series

The Dogiecreek series consists of deep, poorly drained soils formed in loamy and sandy alluvium on flood plains and in upland drainageways. Permeability is moderate. Slopes range from 0 to 2 percent.

Typical pedon of Dogiecreek fine sandy loam, in an area of Hanly-Dogiecreek fine sandy loams, 1,050 feet west and 185 feet south of the northeast corner of sec. 26, T. 19 N., R. 5 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable; common fine roots; moderately alkaline; abrupt smooth boundary.

Cz—3 to 6 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to moderate medium and fine subangular blocky; hard, friable; few fine compressed roots; few fine nests of salts; slight effervescence; strongly alkaline; clear wavy boundary.

Czg1—6 to 12 inches; olive gray (5Y 5/2) loam, olive gray (5Y 4/2) moist; common fine distinct light olive brown (2.5Y 5/6) mottles; thin strata of light gray (2.5Y 6/1) material; weak medium subangular blocky structure; slightly hard, very friable; very few fine compressed roots; strong effervescence; few fine nests of gypsum crystals and other salts; very strongly alkaline; clear wavy boundary.

Czg2—12 to 20 inches; light olive gray (5Y 6/2) fine sandy loam, olive gray (5Y 4/2) moist; thin strata of light gray (2.5Y 6/1) material; common fine distinct light olive brown (2.5Y 5/6) mottles; massive; soft, very friable; very few fine roots; slight effervescence; common fine nests of gypsum crystals and other salts; very strongly alkaline; clear wavy boundary.

Czg3—20 to 41 inches; light gray (5Y 7/2) fine sandy loam, olive gray (5Y 5/2) moist; common fine distinct light olive brown (2.5Y 5/6) mottles; massive; soft, very friable; strong effervescence; few fine accumulations of carbonate; few fine nests of gypsum crystals and other salts; very strongly alkaline; clear wavy boundary.

Cg—41 to 60 inches; light olive gray (5Y 6/2) loamy fine sand, olive gray (5Y 5/2) moist; common medium distinct light olive brown (2.5Y 5/6) mottles; loose; slight effervescence; moderately alkaline.

The depth to carbonates ranges from 2 to 9 inches. The A horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 or 2. It dominantly is fine sandy loam but in some pedons is very fine sandy loam or loam. It is 0.5 inch to 4.0 inches thick. The Cz horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2. It is very fine sandy loam, silt loam, or loam. The clay content in this horizon ranges from 10 to 18 percent. The Czg and Cg horizons have hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 or 2. They are stratified fine sandy loam, silt loam, loam, loamy fine sand, or sand.

Eapa Series

The Eapa series consists of deep, well drained soils formed in loamy material on upland fans and high terraces. Permeability is moderate. Slopes range from 0 to 3 percent.

Typical pedon of Eapa loam, 0 to 3 percent slopes, 1,575 feet east and 160 feet south of the northwest corner of sec. 18, T. 16 N., R. 2 E.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; soft, very friable; many fine roots; neutral; clear smooth boundary.

Bt1—4 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and plastic; many fine roots; shiny films on faces of peds; slightly acid; clear wavy boundary.

Bt2—8 to 13 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and plastic; many fine roots; shiny films on faces of peds; neutral; clear wavy boundary.

BC—13 to 20 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, very friable; common fine roots; neutral; abrupt wavy boundary.

BCk—20 to 30 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable; few fine roots; strong effervescence; mildly alkaline; abrupt wavy boundary.

Ab—30 to 34 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; massive; hard, friable, slightly sticky and plastic; few fine roots; many fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C1—34 to 44 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and plastic; few fine roots; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—44 to 60 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; massive; slightly hard, friable, sticky and plastic; few fine roots; few medium and fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the mollic epipedon ranges from 7 to 15 inches. The depth to free carbonates ranges from 12 to 30 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is loam but in some pedons is very fine sandy loam or silt loam. It is 4 to 6 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It is clay loam or loam. The content of clay in this horizon is as low as 24 percent in some pedons and as high as 34 percent in others. Some pedons have a Bk horizon. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. It dominantly is loam or clay loam, but thin layers of fine sandy loam, silt loam, or silty clay are in some pedons. Some pedons do not have a buried horizon.

Farnuf Series

The Farnuf series consists of deep, well drained soils formed in loamy alluvium on terraces and foot slopes. Permeability is moderate. Slopes range from 2 to 6 percent.

Typical pedon of Farnuf loam, 2 to 6 percent slopes, 2,580 feet west and 600 feet south of the northeast corner of sec. 5, T. 22 N., R. 8 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; slightly hard, friable; slightly acid; abrupt smooth boundary.

Bt1—5 to 14 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; shiny films on faces of peds; slightly acid; clear smooth boundary.

Bt2—14 to 19 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, sticky and plastic; shiny films on faces of peds; neutral; clear wavy boundary.

Bk1—19 to 28 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; many coarse accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

Bk2—28 to 35 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; hard, friable, sticky and slightly plastic; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C—35 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, sticky and slightly plastic; few fine accumulations of carbonate; strong effervescence; few fine nests of gypsum crystals; moderately alkaline.

The depth to carbonates ranges from 13 to 25 inches. The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It dominantly is loam but in some pedons is silt loam or clay loam. It is 5 to 7 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 to 4. It is loam, clay loam, or silty clay loam. The content of clay in this horizon is as low as 25 percent in some pedons and as high as 35 percent in others. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is stratified loam, clay loam, or silty clay loam.

Fleak Series

The Fleak series consists of shallow, excessively drained soils formed in sandy residuum on uplands. Permeability is rapid. Slopes range from 2 to 50 percent.

Typical pedon of Fleak loamy fine sand, in an area of Fleak-Trey-Rock outcrop complex, 15 to 50 percent slopes, 1,300 feet south and 900 feet west of the northeast corner of sec. 22, T. 19 N., R. 4 E.

A—0 to 5 inches; grayish brown (2.5Y 5/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure parting to single grain; loose; many fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C1—5 to 10 inches; grayish brown (2.5Y 5/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

C2—10 to 16 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few fine roots; strong effervescence; moderately alkaline; clear irregular boundary.

Cr1—16 to 36 inches; yellowish brown (10YR 5/4), weakly consolidated sandstone, dark brown (10YR

4/3) moist; strong effervescence; moderately alkaline; clear wavy boundary.

Cr2—36 to 60 inches; olive (5Y 5/3), weakly consolidated sandstone, olive (5Y 4/3) moist; strong effervescence; moderately alkaline.

The depth to bedrock ranges from 10 to 20 inches. The depth to carbonates ranges from 0 to 6 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It dominantly is loamy fine sand but in some pedons is fine sandy loam. It is 3 to 5 inches thick. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is loamy fine sand or loamy sand. The Cr horizon has hue of 10YR, 2.5Y, or 5Y and value of 5 to 7 (4 or 5 moist). It dominantly is weakly consolidated sandstone or siltstone but has layers of clayey shale in some pedons. Some layers are not calcareous.

Gerdrum Series

The Gerdrum series consists of deep, well drained soils formed in alluvium on terraces and uplands. Permeability is very slow. Slopes range from 0 to 4 percent.

Typical pedon of Gerdrum silt loam, 0 to 4 percent slopes, 1,815 feet east and 825 feet south of the northwest corner of sec. 10, T. 20 N., R. 6 E.

E—0 to 2 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure parting to weak medium and fine granular; soft, very friable; many fine roots; neutral; abrupt wavy boundary.

Bt1—2 to 5 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure parting to strong medium subangular blocky; very hard, very firm, sticky and plastic; common fine compressed roots; light brownish gray (10YR 6/2) silt coatings on the rounded tops of the columns; shiny films on faces of peds; moderately alkaline; abrupt wavy boundary.

Bt2—5 to 16 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to strong coarse and medium subangular blocky; very hard, very firm, sticky and plastic; shiny films on faces of peds; few fine compressed roots; slight effervescence; strongly alkaline; diffuse irregular boundary.

Btz—16 to 27 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate coarse and medium subangular blocky; very hard, very firm, sticky and plastic; shiny films on faces of peds; few fine compressed roots; slight effervescence; common medium and fine nests of gypsum crystals and other salts; mildly alkaline; diffuse irregular boundary.

Bz—27 to 36 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and plastic; few fine compressed roots; slight effervescence; common fine and medium nests of gypsum crystals and other salts; moderately alkaline; diffuse irregular boundary.

C—36 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; slight effervescence; few fine nests of gypsum crystals and other salts; moderately alkaline.

The depth to gypsum crystals and other salts ranges from 15 to 24 inches. The depth to carbonates ranges from 50 to 60 inches.

The E horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It dominantly is silt loam but in some pedons is loam, clay loam, or silty clay loam. It is 2 to 4 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is silty clay or clay loam. The content of clay in this horizon is as low as 35 percent in some pedons and as high as 55 percent in others. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is clay loam or clay.

Glendive Series

The Glendive series consists of deep, well drained soils formed in loamy and sandy alluvium on terraces and flood plains. Permeability is moderately rapid. Slopes range from 0 to 6 percent.

Typical pedon of Glendive fine sandy loam, 800 feet east and 685 feet south of the northwest corner of sec. 11, T. 18 N., R. 1 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; thin lenses of dark grayish brown (2.5Y 4/2) fine sandy loam 1/8 to 1/4 inch thick; soft, very friable; many fine roots; neutral; abrupt wavy boundary.

C1—4 to 8 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; lenses of grayish brown (2.5Y 5/2) and very dark grayish brown (2.5Y 3/2) fine sandy loam 1/8 to 1/4 inch thick; soft, very friable; many fine and medium roots; slight effervescence; neutral; abrupt wavy boundary.

C2—8 to 11 inches; olive (5Y 5/3) loamy sand, olive (5Y 4/3) moist; single grain; soft, loose; many fine and medium roots; strong effervescence; mildly alkaline; abrupt wavy boundary.

C3—11 to 16 inches; olive (5Y 5/3) loam, olive (5Y 4/3) moist; massive; soft, very friable; common fine roots;

strong effervescence; mildly alkaline; abrupt wavy boundary.

C4—16 to 30 inches; olive (5Y 5/3) fine sandy loam, olive (5Y 4/3) moist; massive; soft, very friable; common fine and medium roots; strong effervescence; mildly alkaline; abrupt wavy boundary.

C5—30 to 60 inches; pale olive (5Y 6/3) stratified fine sandy loam, sandy loam, and loam, olive (5Y 4/3) moist; massive; soft, very friable; common fine and medium roots; moderately alkaline.

The depth to carbonates ranges from 0 to 8 inches. The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 to 5 moist), and chroma of 2 to 4. It dominantly is fine sandy loam but in some pedons is loam. It is 4 to 8 inches thick. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is stratified fine sandy loam, sandy loam, loam, or loamy sand. Some layers are not calcareous.

Grail Series

The Grail series consists of deep, well drained and moderately well drained soils formed in alluvium in upland swales and on fans and terraces. Permeability is moderately slow. Slopes range from 0 to 3 percent.

Typical pedon of Grail silt loam, in an area of Grail-Daglum complex, 0 to 3 percent slopes, 1,100 feet east and 900 feet south of the northwest corner of sec. 14, T. 19 N., R. 8 E.

A—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium and fine subangular blocky structure parting to weak medium and fine granular; slightly hard, friable; many medium and fine roots; slightly acid; clear wavy boundary.

Bt1—6 to 12 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse and medium prismatic structure parting to weak medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; many fine and medium roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bt2—12 to 16 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; common fine and medium roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bt3—16 to 27 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate coarse prismatic structure parting to moderate coarse and medium subangular blocky; very hard, firm, sticky and plastic; common fine and medium roots; shiny films on faces of peds; neutral; abrupt wavy boundary.

Bk—27 to 36 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; few fine and medium roots; shiny films on faces of peds; common fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Bkz—36 to 56 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common fine accumulations of carbonate; strong effervescence; few fine nests of gypsum crystals; moderately alkaline; clear wavy boundary.

C—56 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; hard, firm, sticky and plastic; few fine roots; few fine accumulations of carbonate; strong effervescence; few fine nests of gypsum; moderately alkaline.

The thickness of the mollic epipedon ranges from 16 to 30 inches. The depth to carbonates ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 2.5Y and value of 4 or 5 (2 or 3 moist). It dominantly is silt loam but in some pedons is silty clay loam. It is 5 to 9 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6 (2 to 4 moist), and chroma of 2 or 4. It is clay loam, silty clay loam, silty clay, or clay. The clay content in this horizon is as low as 35 percent in some pedons and as high as 45 percent in others. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is silty clay loam, clay loam, or silty clay. Some pedons have strata of fine sandy loam or loamy fine sand below a depth of 40 inches. Some have buried horizons below a depth of 30 inches.

Hanly Series

The Hanly series consists of deep, somewhat excessively drained soils formed in stratified, sandy alluvium on flood plains. Permeability is rapid. Slopes range from 0 to 2 percent.

Typical pedon of Hanly loamy fine sand, 1,555 feet south and 620 feet west of the northeast corner of sec. 31, T. 20 N., R. 9 E.

A—0 to 5 inches; grayish brown (2.5Y 5/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; thin bands of very dark grayish brown (10YR 3/2) loamy sand 1/8 to 1/4 inch thick; many fine and medium roots; slight effervescence; mildly alkaline; clear wavy boundary.

C1—5 to 17 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; thin bands of very dark grayish brown (10YR 3/2) loamy sand 1/8 to 1/4 inch thick; common fine and medium roots; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—17 to 40 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few fine roots; slight effervescence; mildly alkaline; diffuse wavy boundary.

C3—40 to 50 inches; light olive gray (5Y 6/2) sand, olive gray (5Y 4/2) moist; many coarse distinct light olive brown (2.5Y 5/6) mottles; single grain; loose; few pebbles; slight effervescence; mildly alkaline; clear irregular boundary.

C4—50 to 60 inches; light olive gray (5Y 6/2) sand, olive gray (5Y 4/2) moist; many coarse distinct light olive brown (2.5Y 5/6) mottles; single grain; loose; slight effervescence; mildly alkaline.

The depth to carbonates ranges from 0 to 9 inches. The A horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. It is 2 to 7 inches thick. It is fine sandy loam, loamy fine sand, or loam. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is stratified loamy fine sand, fine sand, sand, or fine sandy loam. Some layers are not calcareous.

Harlem Series

The Harlem series consists of deep, well drained soils formed in alluvium on flood plains. Permeability is slow. Slopes range from 0 to 2 percent slopes.

Typical pedon of Harlem silty clay, channeled, 1,980 feet north and 1,540 feet west of the southeast corner of sec. 29, T. 15 N., R. 3 E.

A1—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure parting to moderate fine granular; very hard, firm, sticky and plastic; many fine very dark grayish brown (2.5Y 3/2) bands 1/8 to 1/2 inch thick; common fine roots; mildly alkaline; clear smooth boundary.

A2—4 to 9 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few fine very dark grayish brown (2.5Y 3/2) bands 1/8 to 1/4 inch thick; few fine roots; mildly alkaline; abrupt wavy boundary.

C1—9 to 15 inches; grayish brown (2.5Y 5/2) and gray (5Y 6/1) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few fine roots; few fine accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

C2—15 to 27 inches; olive gray (5Y 5/2) and olive (5Y 5/3) stratified loam, silt loam, and clay loam, olive gray (5Y 4/2) and olive (5Y 4/3) moist; massive; very hard, friable, slightly sticky and plastic; few fine roots; few fine accumulations of carbonate; slight effervescence; few fine nests of gypsum crystals; mildly alkaline; abrupt wavy boundary.

C3—27 to 37 inches; olive (5Y 5/3) stratified silty clay loam and silty clay, olive (5Y 4/3) moist; massive; very hard, firm, sticky and plastic; very few fine roots; few fine accumulations of carbonate; slight effervescence; few fine nests of gypsum crystals; mildly alkaline; clear wavy boundary.

C4—37 to 60 inches; olive (5Y 5/3) stratified silty clay loam, silty clay, and clay, olive (5Y 4/3) moist; massive; hard, friable, sticky and plastic; very few fine roots; few fine accumulations of carbonate; slight effervescence; few fine nests of gypsum crystals; mildly alkaline.

In some pedons strata of sandy loam and sand are below a depth of 40 inches. The depth to carbonates ranges from 0 to 9 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is 6 to 10 inches thick. It dominantly is silty clay but in some pedons is clay, silty clay loam, or silt loam. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (3 to 5 moist), and chroma of 2 to 4.

Havre Series

The Havre series consists of deep, well drained soils formed in loamy alluvium on flood plains and low terraces. Permeability is moderate. Slopes range from 0 to 2 percent.

Typical pedon of Havre loam, in an area of Havre-Harlem complex, 700 feet south and 500 feet east of the northwest corner of sec. 36, T. 19 N., R. 1 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; many fine roots; slightly acid; gradual wavy boundary.

C1—5 to 15 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; very dark grayish brown (10YR 3/2) strata 1/8 to 1/2 inch thick ; massive; slightly hard, friable; few fine roots; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—15 to 21 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; strong effervescence; mildly alkaline; gradual wavy boundary.

C3—21 to 26 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; mildly alkaline; gradual wavy boundary.
C4—26 to 30 inches; grayish brown (2.5Y 5/2) sand and fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; mildly alkaline; gradual wavy boundary.
C5—30 to 39 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; slight effervescence; mildly alkaline; gradual wavy boundary.
C6—39 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and plastic; mildly alkaline.

The depth to carbonates ranges from 0 to 9 inches. The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is 5 to 9 inches thick. It dominantly is loam but in some pedons is silt loam. Some pedons have an AC horizon. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It dominantly is stratified loam and clay loam but has lenses of fine sandy loam, loamy sand, sand, fine sand, sandy clay loam, or silty clay loam. The content of clay in the control section is as low as 18 percent in some pedons and as high as 30 percent in others.

Heil Series

The Heil series consists of deep, poorly drained soils formed in clayey alluvium in depressions. Permeability is very slow. Slopes are less than 1 percent.

Typical pedon of Heil silt loam, 1,300 feet west and 120 feet south of the northeast corner of sec. 6, T. 18 N., R. 9 E.

E—0 to 1 inch; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; few fine distinct light olive brown (2.5Y 5/6) and yellowish brown (10YR 5/6) mottles; weak thin platy structure; slightly hard, very friable; many fine roots; medium acid; abrupt wavy boundary.
Bt1—1 to 8 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; strong coarse and medium columnar structure parting to strong coarse and medium blocky; very hard, firm, sticky and plastic; light gray (10YR 6/1) coatings on the rounded tops of the columns; few fine distinct light olive brown (2.5Y 5/6) mottles; shiny surfaces on faces of peds; common fine compressed roots; slightly acid; clear wavy boundary.
Bt2—8 to 18 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; strong coarse prismatic structure parting to strong coarse and medium subangular blocky; very hard, firm, sticky and plastic; shiny films on faces of peds; common fine compressed roots; neutral; clear wavy boundary.
BCzg—18 to 35 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; moderate coarse and medium subangular blocky structure; very hard, firm, sticky and plastic; shiny films on faces of peds; few fine compressed roots; common medium nests of gypsum crystals and other salts; mildly alkaline; abrupt wavy boundary.
Cg1—35 to 55 inches; olive gray (5Y 5/2) clay loam, olive gray (5Y 4/2) moist; common fine distinct dark yellowish brown (10YR 4/6) mottles; massive; hard, friable, sticky and plastic; very few fine roots; slight effervescence; mildly alkaline; clear wavy boundary.
Cg2—55 to 60 inches; light olive gray (5Y 6/2) clay loam, olive (5Y 5/3) moist; few fine faint dark yellowish brown (10YR 4/6) mottles; massive; hard, friable, sticky and plastic; very few fine roots; many coarse accumulations of carbonate; strong effervescence; mildly alkaline.

The depth to free carbonates ranges from 15 to 38 inches. The depth to visible salts ranges from about 15 to 30 inches. Some pedons have an A horizon, which is 1 or 2 inches thick.

The E horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2. It dominantly is silt loam but in some pedons is silty clay loam. It is 1 to 3 inches thick. The Bt horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 or 2. It is silty clay or clay. Some pedons have a Bk horizon. The C horizon has hue of 2.5Y or 5Y, value of 5 to 8 (4 to 6 moist), and chroma of 1 to 4. It is silty clay loam, loam, silty clay, or clay. Soft bedrock, lenses of sand and gravel, or buried horizons are below a depth of 40 inches in some pedons.

Hisle Series

The Hisle series consists of moderately deep, well drained soils formed in clayey residuum on uplands. Permeability is very slow. Slopes range from 0 to 9 percent.

Typical pedon of Hisle silt loam, in an area of Hisle-Slickspots complex, 0 to 6 percent slopes, 1,760 feet east and 300 feet south of the northwest corner of sec. 17, T. 15 N., R. 1 E.

E—0 to 1 inch; gray (10YR 6/1) silt loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure parting to moderate fine granular; soft, very friable; common fine roots; slightly acid; abrupt wavy boundary.
Bt1—1 to 4 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium

columnar structure parting to moderate medium subangular blocky; very hard, very firm, sticky and plastic; gray (2.5Y 6/1) coatings on the tops of the columns; shiny films on faces of peds; few fine compressed roots; mildly alkaline; gradual wavy boundary.

Bt2—4 to 14 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, very firm, sticky and plastic; few fine compressed roots; mildly alkaline; few fine nests of gypsum crystals; gradual wavy boundary.

BCz—14 to 22 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; moderate coarse and medium subangular blocky structure; very hard, very firm, sticky and plastic; shiny films on faces of peds; common medium nests of gypsum crystals; mildly alkaline; clear wavy boundary.

Cz—22 to 34 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; very hard, firm, sticky and plastic; about 15 percent soft shale fragments; common medium nests of gypsum crystals; mildly alkaline; clear wavy boundary.

Cr—34 to 60 inches; gray (5Y 5/1) shale, dark gray (5Y 4/1) moist; brownish yellow (10YR 6/6) coatings on bedding planes (iron and manganese oxides); slightly acid.

The depth to shale ranges from 20 to 40 inches. Some pedons are calcareous in the lower part of the solum and in the underlying material.

The E horizon has hue of 10YR or 2.5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2. It is 1 to 3 inches thick. The Bt horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 3. It is clay or silty clay. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. The content of shale fragments in this horizon ranges from 10 to 35 percent. The Cr horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2.

Hisle Variant

The Hisle Variant consists of moderately deep, poorly drained soils formed in clayey residuum on narrow flood plains. Permeability is very slow. Slopes ranges from 0 to 2 percent.

Typical pedon of Hisle Variant silt loam, in an area of Sage-Hisle Variant complex, 0 to 2 percent slopes, 1,440 feet south and 200 feet east of the northwest corner of sec. 16, T. 15 N., R. 1 E.

E—0 to 1 inch; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; weak very thin platy structure parting to weak fine granular; soft, very friable; common fine roots; slightly acid; abrupt wavy boundary.

Bt—1 to 5 inches; olive gray (5Y 5/2) silty clay, olive gray (5Y 4/2) moist; moderate medium columnar structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common fine compressed roots; slightly acid; clear wavy boundary.

BCz—5 to 13 inches; light olive gray (5Y 6/2) silty clay, olive (5Y 5/3) moist; few fine faint light yellowish brown (10YR 6/4) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; very hard, firm, sticky and plastic; few fine compressed roots; few medium concretions (iron and manganese oxides); few fine nests of gypsum crystals; neutral; gradual wavy boundary.

Czg—13 to 38 inches; light gray (5Y 7/2) silty clay, light olive gray (5Y 6/2) moist; common medium and fine distinct light yellowish brown (10YR 6/4) mottles; massive; very hard, firm, sticky and plastic; few fine compressed roots; many medium and fine concretions (iron and manganese oxides); about 25 percent fragments of shale; common medium nests of gypsum crystals; medium acid; diffuse irregular boundary.

Cr—38 to 60 inches; light olive gray (5Y 6/2) shale, olive gray (5Y 5/2) moist; many coarse and medium prominent yellowish brown (10YR 5/6) mottles; many coarse concretions (iron and manganese oxides); common medium nests of gypsum crystals; medium acid.

Typically, these soils do not have free carbonates, but some pedons are calcareous below a depth of 4 inches. The depth to shale ranges from 20 to 40 inches.

The E horizon has hue of 10YR, 2.5Y, or 5Y. It dominantly is silt loam but in some pedons is loam or silty clay loam. It is 0.5 inch to 3.0 inches thick. The Bt and Czg horizons are silty clay or clay. The Bt horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 3. The Czg horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. It has few to many, distinct or prominent mottles. The Cr horizon has hue of 2.5Y or 5Y or is neutral in hue. It has value of 4 to 7 (4 to 6 moist) and chroma of 0 to 4.

Kirby Series

The Kirby series consists of deep, well drained soils formed in material weathered from scoria on uplands. Permeability is rapid. Slopes range from 15 to 60 percent.

Typical pedon of Kirby channery sandy loam, in an area of Kirby-Cabbart-Rock outcrop complex, 15 to 60 percent slopes, 1,040 feet north and 850 feet west of the southeast corner of sec. 32, T. 22 N., R. 1 E.

A—0 to 7 inches; brown (7.5YR 5/4) channery sandy loam, dark brown (7.5YR 4/4) moist; weak fine

granular structure; soft, very friable; about 20 percent fragments of porcellanite more than 2 millimeters in size; many fine roots; slight effervescence; mildly alkaline; gradual wavy boundary.

C1—7 to 14 inches; pink (5YR 7/4) extremely channery sandy loam, light reddish brown (5YR 6/4) moist; few roots in cracks and between plates; 60 to 70 percent fragments of porcellanite, thin lime coatings on the fragments of porcellanite; slight effervescence; moderately alkaline; gradual irregular boundary.

C2—14 to 24 inches; pink (5YR 7/4) medium plates of porcellanite, light reddish brown (5YR 6/4) moist; few roots in cracks and between plates; moderately alkaline; diffuse irregular boundary.

C3—24 to 60 inches; pink (5YR 7/4) large fragments of porcellanite, light reddish brown (5YR 6/4) moist; moderately alkaline.

The A horizon has hue of 5YR or 7.5YR, value of 5 or 6 (4 or 5 moist), and chroma of 3 or 4. It dominantly is channery sandy loam but in some pedons is very channery sandy loam. It is 4 to 7 inches thick. Some pedons do not have carbonates in the upper 5 inches. Some have a thin AC horizon. The C1 horizon has hue of 2.5YR to 7.5YR, value of 6 to 8 (5 to 7 moist), and chroma of 3 to 6. It is the very channery or extremely channery analogs of sandy loam or loam. The content of porcellanite fragments ranges from 35 to 80 percent in the upper part of the C horizon and is more than 85 percent in the lower part. The porcellanite in the lower part does not have free carbonates in some pedons.

Korchea Series

The Korchea series consists of deep, well drained soils formed in loamy and silty alluvium on flood plains. Permeability is moderate. Slopes range from 0 to 2 percent.

Typical pedon of Korchea loam, 1,080 feet west and 415 feet south of the northeast corner of sec. 24, T. 21 N., R. 8 E.

Ap1—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strata 1/8 to 1/4 inch thick; weak fine granular structure; slightly hard, very friable; many fine roots; neutral; abrupt wavy boundary.

Ap2—4 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure parting to weak fine granular; slightly hard, very friable; strata 1/8 to 1/2 inch thick; many fine roots; slight effervescence; neutral; abrupt wavy boundary.

A1—7 to 11 inches; grayish brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; strata 1/4 to 1/2 inch thick; many fine roots; strong effervescence; mildly alkaline; abrupt wavy boundary.

A2—11 to 15 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; common fine roots; common fine accumulations of carbonate; strong effervescence; moderately alkaline; abrupt wavy boundary.

C1—15 to 20 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; massive; hard, friable; common fine roots; common fine accumulations of carbonate; strong effervescence; common fine nests of gypsum; moderately alkaline; clear wavy boundary.

C2—20 to 27 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable; common fine roots; common medium accumulations of carbonate; strong effervescence; common fine nests of gypsum crystals; strongly alkaline; clear wavy boundary.

C3—27 to 55 inches; light brownish gray (2.5Y 6/2) stratified loam and fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable; few fine roots; strong effervescence; strongly alkaline; clear wavy boundary.

Ab—55 to 60 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; hard, friable, sticky and plastic; few fine roots; strong effervescence; common fine nests of gypsum crystals; strongly alkaline.

The dark colors extend below a depth of 16 inches, but the soils do not have a mollic epipedon because they are stratified. The depth to carbonates ranges from 0 to 9 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is 6 to 15 inches thick. It dominantly is loam but in some pedons is fine sandy loam, loam, or silt loam. The C horizon has hue of 2.5Y or 5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 to 4. It is fine sandy loam, loam, silt loam, or silty clay loam. Some pedons do not have a buried horizon.

Kremlin Series

The Kremlin series consists of deep, well drained soils formed in loamy alluvium on fans and terraces. Permeability is moderate. Slopes range from 0 to 3 percent.

Typical pedon of Kremlin loam, 0 to 3 percent slopes, 2,475 feet south and 2,150 feet east of the northwest corner of sec. 2, T. 19 N., R. 1 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; soft, friable; many fine roots; slightly acid; clear wavy boundary.

Bw1—6 to 10 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable; many fine roots; neutral; clear wavy boundary.

Bw2—10 to 16 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak medium and fine prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable; common fine roots; neutral; abrupt wavy boundary.

Bw3—16 to 20 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, friable; slight effervescence; neutral; clear wavy boundary.

Bk—20 to 38 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; hard, firm; few fine and medium accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

C—38 to 60 inches; light olive gray (5Y 6/2) stratified loam, olive gray (5Y 5/2) moist; massive; slightly hard, friable; strong effervescence; moderately alkaline.

The depth to carbonates ranges from 8 to 20 inches. The mollic epipedon is 6 to 9 inches thick.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is 6 to 10 inches thick. It dominantly is loam but in some pedons is silt loam or very fine sandy loam. The Bw horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 or 3. It is loam or silt loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. It typically is stratified loam but in some pedons has thin lenses of silt loam or sandy loam.

Kyle Series

The Kyle series consists of deep, well drained soils formed in clayey material on uplands and foot slopes. When dry, these soils are characterized by cracks, which are 0.5 to 1.0 inch wide and several feet long and extend through the subsoil. Permeability is very slow. Slopes range from 2 to 6 percent.

Typical pedon of Kyle clay, 2 to 6 percent slopes, 1,585 feet east and 20 feet north of the southwest corner of sec. 32, T. 15 N., R. 4 E.

A1—0 to 1 inch; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; hard, firm, sticky and plastic; many fine roots; neutral; clear wavy boundary.

A2—1 to 5 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; very hard, firm, sticky and plastic; many fine roots; strong effervescence; mildly alkaline; clear wavy boundary.

Bw—5 to 13 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; extremely hard, very firm, sticky and plastic; common fine roots; few intersecting slickensides; strong effervescence; moderately alkaline; clear irregular boundary.

Bk—13 to 20 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; very hard, firm, sticky and plastic; common fine roots; few intersecting slickensides; common medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual irregular boundary.

Cz1—20 to 32 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, sticky and plastic; few fine roots; few fine accumulations of carbonate; slight effervescence; many fine nests of gypsum crystals; mildly alkaline; clear irregular boundary.

Cz2—32 to 60 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; extremely hard, very firm, sticky and plastic; very few fine roots; few fine accumulations of carbonate; strong effervescence only in the accumulations; many medium nests of gypsum crystals; mildly alkaline.

Some pedons are calcareous at the surface. Few to many nests of gypsum crystals are below a depth of 15 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2. It is 3 to 6 inches thick. The Bw and C horizons have hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. Some pedons have thin layers of coarser textured material below a depth of 40 inches.

Lallie Series

The Lallie series consists of deep, poorly drained soils formed in clayey alluvium in stream channel meanders on flood plains. Permeability is slow. Slopes range from 0 to 2 percent.

Typical pedon of Lallie silty clay loam, 660 feet east and 650 feet south of the northwest corner of sec. 36, T. 19 N., R. 1 E.

A—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strata less than 1/8 inch thick; common fine distinct

yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; neutral; gradual wavy boundary.

Cg1—5 to 40 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; few coarse distinct olive yellow (2.5Y 6/6) mottles; massive; very hard, firm, sticky and plastic; stained sand grains and light gray (5Y 7/2) silt coatings on the horizontal faces of strata less than 1/8 inch thick; few fine roots; slight effervescence; mildly alkaline; gradual wavy boundary.

Cg2—40 to 60 inches; gray (5Y 6/1) silty clay loam, gray (5Y 5/1) moist; strata of sand less than 1/8 inch thick and strata of very fine sandy loam less than 1/2 inch thick; light gray (5Y 7/2) silt coatings on faces of strata; few fine distinct olive yellow (2.5Y 6/6) mottles; massive; very hard, firm, sticky and plastic; slight effervescence; mildly alkaline.

The depth to carbonates ranges from 0 to 9 inches. The A horizon has hue of 2.5Y or 5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2. It dominantly is silty clay loam but in some pedons is fine sandy loam, loam, clay loam, silty clay, or clay. It is 1 to 5 inches thick. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 or 2. It is silty clay or silty clay loam that has strata of other textures.

Lantry Series

The Lantry series consists of moderately deep, well drained soils formed in silty residuum on uplands. Permeability is moderate. Slopes range from 9 to 25 percent.

Typical pedon of Lantry loam, in an area of Cabba-Lantry-Amor loams, 9 to 25 percent slopes, 2,400 feet west and 2,610 feet north of the southeast corner of sec. 24, T. 21 N., R. 6 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and fine subangular blocky structure parting to weak fine granular; slightly hard, friable; many fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

Bw—4 to 9 inches; light brownish gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable; many fine roots; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Bk1—9 to 18 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable; common fine roots; many fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Bk2—18 to 28 inches; light gray (2.5Y 7/2) silt loam, light olive brown (2.5Y 5/4) moist; common medium and coarse olive yellow (2.5Y 6/6) mottles; weak medium subangular blocky structure; soft, friable; few fine roots; about 45 percent fragments of soft siltstone; common coarse and many medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Cr—28 to 60 inches; light gray (2.5Y 7/2), bedded siltstone, light olive brown (2.5Y 5/4) moist; many coarse and medium olive yellow (2.5Y 6/6) and brownish yellow (10YR 6/6) mottles; very few fine accumulations of carbonate; strong effervescence; common medium nests of gypsum crystals and other salts; moderately alkaline.

Some pedons are leached of carbonates to a depth of 9 inches. The depth to soft bedrock ranges from about 20 to 40 inches.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 to 4. It is 2 to 4 inches thick. It dominantly is loam but is silt loam in some pedons. Some pedons have an AC horizon. The Bw horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is loam, silt loam, or very fine sandy loam. The lower part of the Bk horizon has fragments of weathered bedrock in most pedons. The Cr horizon occurs as layers of sandstone, siltstone, or shale.

Lismas Series

The Lismas series consists of shallow, well drained soils formed in clayey residuum on uplands. Permeability is very slow. Slopes range from 3 to 60 percent.

Typical pedon of Lismas clay, in an area of Lismas-Winler clays, 6 to 25 percent slopes, 1,125 feet south and 540 feet west of the northeast corner of sec. 19, T. 15 N., R. 1 E.

A—0 to 3 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak coarse and medium subangular blocky structure parting to moderate medium and fine granular; slightly hard, very firm, sticky and plastic; many fine roots; neutral; clear irregular boundary.

C1—3 to 9 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak coarse and medium subangular blocky structure; hard, firm, sticky and plastic; many fine roots; few fine nests of gypsum crystals; neutral; gradual irregular boundary.

C2—9 to 15 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; hard, firm, sticky and plastic; very few fine compressed roots; about 20

percent fragments of clayey shale; few fine nests of gypsum crystals; neutral; clear irregular boundary.

Cr1—15 to 26 inches; olive (5Y 5/3) shale, olive (5Y 4/3) moist; many dark stains (iron and manganese oxides) along fractures in the shale; common nests of gypsum crystals; neutral; diffuse irregular boundary.

Cr2—26 to 60 inches; olive (5Y 5/3) shale, olive (5Y 4/3) moist; many dark stains (iron and manganese oxides) along fractures in the shale; few nests of gypsum crystals; slightly acid.

The depth to shale ranges from 10 to 20 inches. The depth to visible salts ranges from 4 to 10 inches.

The A horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is 1 to 3 inches thick. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. The Cr horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4.

Marmarth Series

The Marmarth series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Permeability is moderate. Slopes range from 2 to 15 percent.

Typical pedon of Marmarth fine sandy loam, in an area of Marmarth-Parchin fine sandy loams, 2 to 6 percent slopes, 545 feet north and 2,140 feet east of the southwest corner of sec. 5, T. 16 N., R. 1 E.

A—0 to 7 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium and fine granular structure; soft, very friable; many fine roots; slightly acid; clear wavy boundary.

Bt1—7 to 11 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; shiny films on faces of peds; common fine roots; slightly acid; clear wavy boundary.

Bt2—11 to 16 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate coarse and medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and plastic; shiny films on faces of peds; common fine roots; neutral; clear wavy boundary.

Bt3—16 to 20 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak coarse and medium prismatic structure parting to weak coarse and medium subangular blocky; hard, friable, slightly sticky and plastic; shiny films on faces of peds; common fine roots; neutral; clear wavy boundary.

Bk1—20 to 27 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable; few fine roots; many coarse and medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

Bk2—27 to 35 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; few roots; many coarse and medium accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cr—35 to 60 inches; grayish brown (2.5Y 5/2), weakly consolidated sandstone, dark grayish brown (2.5Y 4/2) moist; few fine accumulations of carbonate; moderately alkaline.

The depth to soft bedrock ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 7 to 16 inches.

The A horizon has hue of 10YR, value of 4 or 5 (3 moist), and chroma of 2 or 3. It dominantly is fine sandy loam but in some pedons is loam. It is 4 to 9 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 to 4. It is sandy clay loam, loam, or clay loam. Some pedons have a C horizon. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It typically is soft sandstone or siltstone, but some pedons have layers of clayey shale.

Nihill Variant

The Nihill Variant consists of moderately deep, somewhat excessively drained soils formed in gravelly material over soft bedrock. These soils are on uplands. Permeability is moderately rapid. Slopes range from 9 to 40 percent.

Typical pedon of Nihill Variant very gravelly loam, in an area of Nihill Variant-Attewan complex, 4 to 40 percent slopes, 440 feet east and 115 feet north of the southwest corner of sec. 17, T. 16 N., R. 2 E.

A—0 to 3 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; many roots; about 40 percent pebbles; slight effervescence; neutral; clear wavy boundary.

C1—3 to 10 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; weak medium and fine granular structure; soft, very friable; 40 to 60 percent pebbles; common roots; strong effervescence; mildly alkaline; clear wavy boundary.

C2—10 to 18 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, slightly plastic; 40 to 60 percent

pebbles; common roots; violent effervescence; mildly alkaline; clear wavy boundary.

2C—18 to 30 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; single grain; about 5 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

3Cr—30 to 60 inches; light gray (10YR 7/2), soft sandstone, grayish brown (10YR 5/2) moist; moderately alkaline.

The depth to carbonates ranges from 0 to 8 inches. The depth to soft bedrock ranges from 20 to 40 inches.

The A horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It dominantly is very gravelly loam but is very gravelly fine sandy loam or gravelly loam in some pedons. It is 3 to 5 inches thick. The C horizon has value of 6 or 7 (4 or 5 moist) and chroma of 2 or 3. It is very gravelly loam, very gravelly loamy sand, or sandy loam. Some pedons do not have a 2C horizon. The Cr horizon typically is weakly consolidated sandstone or siltstone bedrock, but some pedons have layers of clayey shale or lignite.

Parchin Series

The Parchin series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Permeability is very slow or slow. Slopes range from 2 to 15 percent.

Typical pedon of Parchin fine sandy loam, in an area of Parchin-Bullock fine sandy loams, 2 to 9 percent slopes, 1,600 feet north and 750 feet east of the southwest corner of sec. 15, T. 16 N., R. 1 E.

A—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; soft, very friable; many fine and medium roots; medium acid; clear wavy boundary.

E—5 to 10 inches; light brownish gray (10YR 6/2) fine sandy loam, dark brown (10YR 4/3) moist; weak thick platy structure parting to weak coarse and medium subangular blocky; soft, very friable; many fine and medium roots; neutral; abrupt smooth boundary.

Bt—10 to 14 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate coarse columnar structure parting to strong medium blocky; very hard, firm, slightly sticky and slightly plastic; light gray (10YR 7/2) coatings on the tops of the columns; common fine and medium compressed roots, mainly along structure faces; very dark grayish brown (10YR 3/2) shiny films on faces of peds; moderately alkaline; clear wavy boundary.

Btk—14 to 18 inches; grayish brown (2.5Y 5/2) sandy clay loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky and slightly plastic; few fine compressed roots; shiny films on faces of peds; common fine and medium accumulations of carbonate; strong effervescence; strongly alkaline; clear wavy boundary.

Bkz1—18 to 22 inches; light brownish gray (2.5Y 6/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky; few fine and medium compressed roots; shiny films on faces of peds; few fine accumulations of carbonate; strong effervescence; common fine nests of gypsum crystals and other salts; strongly alkaline; clear wavy boundary.

Bkz2—22 to 28 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse and medium prismatic structure parting to moderate coarse and medium subangular blocky; very hard, firm, slightly sticky and slightly plastic; few fine compressed roots; common fine accumulations of carbonate; strong effervescence, few fine nests of gypsum crystals; moderately alkaline; clear wavy boundary.

Cz—28 to 34 inches; light gray (5Y 6/1) sandy clay loam, olive gray (5Y 4/2) moist; massive; hard, friable; few fine compressed roots; few fine accumulations of carbonate; slight effervescence; few fine nests of gypsum; strongly alkaline; abrupt wavy boundary.

Cr1—34 to 53 inches; light gray (5Y 6/1), weakly consolidated, fine grained sandstone, olive gray (5Y 4/2) moist; very few fine compressed roots between bedding planes; few fine accumulations of carbonate; slight effervescence; abrupt irregular boundary.

Cr2—53 to 60 inches; light gray (5Y 6/1), weakly consolidated, fine grained sandstone, olive gray (5Y 4/2) moist; very few fine compressed roots between bedding planes; few fine dark concretions (iron and manganese oxides); few fine accumulations of carbonate.

The depth to soft bedrock ranges between 20 and 40 inches. The depth to carbonates ranges from 10 to 25 inches.

The A and E horizons are fine sandy loam or loamy fine sand. The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 or 3. It is 3 to 7 inches thick. The E horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It is 2 to 6 inches thick.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. In some pedons it does not have free carbonates in the lower part. It is loam, clay loam, or sandy clay loam. The content of clay in this horizon is as low as 20 percent in some pedons and as high as 35 percent in others.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 3. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. It typically is weakly consolidated siltstone or sandstone, but some layers are clayey shale and lignite.

Parshall Series

The Parshall series consists of deep, well drained soils formed in local alluvium on terraces and on fans in the uplands. Permeability is moderately rapid. Slopes range from 0 to 3 percent.

Typical pedon of Parshall fine sandy loam, 0 to 3 percent slopes, 2,250 feet north and 250 feet east of the southwest corner of sec. 29, T. 23 N., R. 7 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; soft, very friable; many fine roots; medium acid; clear wavy boundary.

Bw1—8 to 33 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; soft, very friable; common fine roots; slightly acid; clear wavy boundary.

Bw2—33 to 42 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, very friable; common fine roots; neutral; abrupt wavy boundary.

C—42 to 60 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable; few fine roots; neutral.

The depth to carbonates ranges from 24 to 60 inches. The thickness of the mollic epipedon ranges from 16 to 45 inches. Some pedons have a buried horizon below a depth of 30 inches.

The A horizon has hue of 10YR and value of 4 or 5 (2 or 3 moist). It dominantly is fine sandy loam but in some pedons is sandy loam. It is 8 to 22 inches thick. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6 (2 to 4 moist), and chroma of 2 or 3. It is sandy loam or fine sandy loam. Some pedons have a BC or Bk horizon, which is similar in color and texture to the C horizon. The C horizon has hue of 10YR or 2.5Y, value of 4 to 7 (3 to 5 moist), and chroma of 1 to 4. Some pedons are underlain by gravelly material.

Reeder Series

The Reeder series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Permeability is moderate. Slopes range from 2 to 15 percent.

Typical pedon of Reeder loam, in an area of Reeder-Cabba loams, 6 to 9 percent slopes, 1,205 feet west and 290 feet south of the northeast corner of sec. 12, T. 18 N., R. 8 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable; many fine roots; slightly acid; abrupt wavy boundary.

Bt1—6 to 11 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; shiny films on faces of peds; common fine roots; neutral; clear wavy boundary.

Bt2—11 to 17 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; shiny films on faces of peds; common fine roots; neutral; abrupt wavy boundary.

Bk1—17 to 24 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, sticky and plastic; few fine roots; many fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

Bk2—24 to 30 inches; light gray (2.5Y 7/2) loam, light yellowish brown (2.5Y 6/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common medium accumulations of carbonate; strong effervescence; few large brownish yellow (10YR 6/6) concretions (iron and manganese oxides); mildly alkaline; clear wavy boundary.

Cr1—30 to 42 inches; light gray (2.5Y 7/2), soft sandstone, light brownish gray (2.5Y 6/2) moist; few fine roots; common medium accumulations of carbonate; strong effervescence; moderately alkaline; abrupt wavy boundary.

Cr2—42 to 51 inches; light gray (2.5Y 7/2), soft sandstone, light brownish gray (2.5Y 6/2) moist; very few fine roots along cracks and seams; few fine yellowish brown (10YR 5/8) concretions and many coarse brownish yellow (10YR 6/6) stains between cracks and seams (iron and manganese oxides); mildly alkaline; abrupt wavy boundary.

Cr3—51 to 60 inches; light gray (5Y 7/2), clayey shale, olive gray (5Y 5/2) moist; many coarse pale olive (5Y 6/4) and light yellowish brown (2.5Y 6/4) stains between cracks and seams; mildly alkaline.

The mollic epipedon is 7 to 16 inches thick. The depth to carbonates ranges from 12 to 25 inches. The depth to bedrock ranges from 20 to 40 inches.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It dominantly is loam but in some pedons is silt loam. It is 5 to 8 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It is clay loam or loam. The content of clay in this horizon is as low as 24 percent in some pedons and as high as 35 percent in others. Some pedons have a C horizon. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7 (3 to 6 moist), and chroma of 1 to 4. It is weakly consolidated sandstone or siltstone that has layers of clayey shale. Some of the layers of bedrock do not have carbonates.

Reva Series

The Reva series consists of shallow, well drained soils formed in gravelly material weathered from hard sandstone on uplands. Permeability is moderately rapid. Slopes range from 6 to 70 percent.

Typical pedon of Reva gravelly very fine sandy loam, in an area of Slimbutte-Reva complex, 6 to 60 percent slopes, 2,600 feet south and 1,040 feet east of the northwest corner of sec. 17, T. 18 N., R. 8 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) gravelly very fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; soft, very friable; many fine and medium roots; about 20 percent fine and medium pebbles of hard sandstone; slight effervescence; mildly alkaline; abrupt wavy boundary.

C1—3 to 8 inches; light brownish gray (2.5Y 6/2) very gravelly very fine sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable; many fine and medium roots; about 35 percent pebbles of sandstone; strong effervescence; mildly alkaline; clear wavy boundary.

C2—8 to 16 inches; white (2.5Y 8/2) very gravelly very fine sandy loam, olive (5Y 5/4) moist; massive; soft, very friable; common fine and medium roots between rock fragments; about 45 percent gravel and cobbles of sandstone; rock fragments coated with carbonate; interiors of rock fragments are noncalcareous; strong effervescence in the matrix; mildly alkaline; diffuse irregular boundary.

R—16 to 24 inches; white (2.5Y 8/2), hard sandstone, pale olive (5Y 6/4) moist; few fine and medium roots along cracks; sandstone fragments coated with carbonate; interiors of rock fragments are noncalcareous.

The depth to consolidated sandstone ranges from 10 to 20 inches. The depth to carbonates is 0 to 5 inches. Some pedons have 1 to 2 inches of mixed forest litter at the surface.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (2 to 4 moist), and chroma of 1 or 2. It dominantly is gravelly very fine sandy loam but in some pedons is gravelly fine sandy loam or gravelly loam. It is 1 to 4 inches thick. Some pedons have a thin AC horizon. The C horizon has hue of 2.5Y or 5Y, value of 5 to 8 (4 to 6 moist), and chroma of 1 to 4. It is very gravelly very fine sandy loam; very gravelly, very channery, or very cobbly loam; very cobbly fine sandy loam; or very cobbly sandy loam. The content of hard sandstone fragments in this horizon ranges from 35 to 60 percent. The R horizon is hard sandstone or siltstone that is highly fractured in the upper part.

Rhame Series

The Rhame series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Permeability is moderately rapid. Slopes range from 2 to 6 percent.

Typical pedon of Rhame fine sandy loam, in an area of Rhame-Parchin fine sandy loams, 2 to 6 percent slopes, 1,155 feet east and 600 feet south of the northwest corner of sec. 36, T. 15 N., R. 4 E.

A—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; many fine roots; slightly acid; clear wavy boundary.

Bw1—5 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; hard, very friable; common fine roots; neutral; clear wavy boundary.

Bw2—9 to 14 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; common fine roots; neutral; gradual wavy boundary.

BC—14 to 22 inches; light yellowish brown (2.5Y 6/4) sandy loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; few fine roots; neutral; gradual wavy boundary.

C—22 to 28 inches; light gray (2.5Y 7/2) sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable; few fine roots; common medium and coarse fragments of soft sandstone; neutral; gradual irregular boundary.

Cr—28 to 60 inches; light gray (2.5Y 7/2), soft sandstone, grayish brown (2.5Y 5/2) moist; few fine roots along fracture planes; neutral.

The depth to soft bedrock ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 7 to 14 inches. Some pedons are calcareous in the lower part of the subsoil and in the C horizon.

The A horizon has hue of 10YR, value of 4 or 5 (3 moist), and chroma of 2 or 3. It dominantly is fine sandy loam but in some pedons is sandy loam. It is 5 to 8 inches thick. The Bw and C horizons are fine sandy loam or sandy loam. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 to 4. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7 (3 to 6 moist), and chroma of 1 to 4. It typically is soft sandstone or siltstone, but some pedons have layers of clayey shale or lignite.

Rhoades Series

The Rhoades series consists of deep, well drained soils formed in alluvium on terraces and uplands. Permeability is very slow. Slopes range from 0 to 9 percent.

Typical pedon of Rhoades loam, in an area of Rhoades-Daglum loams, 0 to 2 percent slopes, 500 feet north and 130 feet west of the southeast corner of sec. 9, T. 21 N., R. 8 E.

E—0 to 2 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable; many fine roots; slightly acid; abrupt wavy boundary.

Bt—2 to 9 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium columnar structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common fine compressed roots; gray (10YR 5/1) silt coatings on the rounded tops of the columns; shiny films on faces of peds; mildly alkaline; clear wavy boundary.

Btz—9 to 15 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, sticky and plastic; common fine compressed roots; shiny films on faces of peds; common fine nests of gypsum crystals and other salts; mildly alkaline; abrupt wavy boundary.

Bz—15 to 28 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very hard, firm, sticky and plastic; few fine compressed roots; shiny films on faces of peds; strong effervescence; common medium nests of gypsum crystals and other salts; moderately alkaline; gradual irregular boundary.

C1—28 to 51 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; very few compressed roots; few fine accumulations of carbonate; strong effervescence; few fine nests of gypsum crystals and other salts; moderately alkaline; gradual irregular boundary.

C2—51 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; very few fine compressed roots; strong effervescence; many medium nests of gypsum crystals and other salts; moderately alkaline.

The depth to visible salts ranges from 6 to 12 inches. The depth to carbonates ranges from 6 to 20 inches. Some pedons have an A horizon, which is less than 2 inches thick.

The E horizon has hue of 10YR, value of 5 or 6 (3 or 4 moist), and chroma of 2. It dominantly is loam but in some pedons is silt loam. It is 2 to 5 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2. It is silty clay loam, silty clay, clay loam, or clay. The content of clay in this horizon is as low as 35 percent in some pedons and as high as 50 percent in others. Some pedons have a Bk horizon. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is silty clay, silty clay loam, clay loam, or clay.

The Rhoades soils in map units AdC, ReB, RnB, ToC, and WbB are taxadjuncts to the series because they are underlain by bedrock at a depth of 20 to 40 inches. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Rockoa Series

The Rockoa series consists of deep, well drained soils formed in colluvial material weathered from sandstone on uplands. Permeability is moderate. Slopes range from 6 to 60 percent.

Typical pedon of Rockoa loam, in an area of Rockoa-Reva complex, 6 to 60 percent slopes, 2,560 feet west and 2,515 feet north of the southeast corner of sec. 9, T. 16 N., R. 2 E.

O—2 inches to 0; partially decomposed forest litter, strongly acid; abrupt smooth boundary.

A—0 to 2 inches; black (10YR 2/1) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; about 20 percent stones and channers of sandstone; many fine and medium roots; medium acid; abrupt wavy boundary.

E—2 to 5 inches; light gray (2.5Y 7/1) loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure parting to weak medium and fine subangular blocky; soft, very friable; about 25 percent stones and channers of sandstone; many fine and medium roots; medium acid; clear irregular boundary.

B/E—5 to 7 inches; grayish brown (2.5Y 5/2) very channery loam, light olive brown (2.5Y 5/4) moist (B); light gray (2.5Y 7/1) very channery loam, dark

grayish brown (2.5Y 4/2) moist (E); weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; about 40 percent fragments of sandstone; common fine and medium roots; medium acid; clear irregular boundary.

Bt1—7 to 11 inches; light gray (2.5Y 7/1) and light brownish gray (2.5Y 6/2) very channery loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few shiny films on faces of peds; about 45 percent fragments of sandstone; common fine and medium roots; slightly acid; clear wavy boundary.

Bt2—11 to 21 inches; light gray (2.5Y 7/1) and light brownish gray (2.5Y 6/2) very channery clay loam, light brownish gray (2.5Y 6/2) moist; weak medium prismatic structure parting to moderate medium and fine granular; hard, friable, sticky and plastic; few fine roots; few shiny films on faces of peds; about 45 percent rock fragments; neutral; abrupt wavy boundary.

C—21 to 60 inches; white (2.5Y 8/1) very channery loam, light gray (2.5Y 7/2) moist; massive; very few fine roots; about 55 percent rock fragments; strong effervescence; mildly alkaline.

Most pedons have 1 to 2 inches of forest litter at the surface, but some do not have an O horizon. The A horizon has hue of 10YR, value of 2 or 3 (2 moist), and chroma of 1 or 2. It is 2 to 4 inches thick. The content of stones, pebbles, or channers in this horizon ranges from 15 to 35 percent. Some pedons do not have an A horizon. The E horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 to 4. It is loam, very fine sandy loam, or silt loam. The content of coarse fragments in this horizon ranges from 15 to 35 percent.

The B and C horizons are very gravelly loam, very channery loam, very gravelly clay loam, or very channery clay loam. The Bt horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. The C horizon has hue of 2.5Y or 5Y, value of 5 to 8 (4 to 7 moist), and chroma of 1 to 4.

Sage Series

The Sage series consists of deep, poorly drained soils formed in clayey and silty alluvium on flood plains. Permeability is slow or very slow. Slopes range from 0 to 2 percent.

Typical pedon of Sage silty clay loam, in an area of Sage-Hisle Variant complex, 0 to 2 percent slopes, 1,250 feet south and 50 feet west of the northeast corner of sec. 17, T. 15 N., R. 1 E.

Az—0 to 5 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; thin crust of white (2.5Y 8/1) and light gray (2.5Y 7/2) salts at the surface; common medium and fine roots; few fine nests of gypsum crystals and other salts; slightly acid; clear wavy boundary.

Cz1—5 to 10 inches; light brownish gray (2.5Y 6/2) silty clay loam, olive brown (2.5Y 4/4) moist; few fine distinct light olive brown (2.5Y 5/6) mottles; massive; hard, firm, sticky and plastic; common fine roots; common fine nests of gypsum crystals and other salts; slightly acid; gradual wavy boundary.

Cz2—10 to 21 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; few fine distinct light olive brown (2.5Y 5/6) mottles; massive; very hard, firm, sticky and plastic; few fine roots; many fine nests of gypsum crystals and other salts; medium acid; clear wavy boundary.

Cz3—21 to 31 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; many medium and coarse distinct olive yellow (2.5Y 6/6) and dark yellowish brown (10YR 4/4) mottles; massive; hard, firm, sticky and plastic; few fine compressed roots; many medium nests of gypsum crystals and other salts; medium acid; gradual wavy boundary.

Cg1—31 to 40 inches; olive gray (5Y 5/2) clay, olive (5Y 4/3) moist; many medium and coarse distinct olive yellow (2.5Y 6/6) and dark brown (10YR 4/3) mottles; massive; hard, firm, sticky and plastic; few fine roots; many fine and medium nests of gypsum crystals and other salts; strongly acid; diffuse wavy boundary.

Cg2—40 to 50 inches; olive gray (5Y 5/2) clay, olive (5Y 4/3) moist; many medium and coarse distinct olive yellow (2.5Y 6/6) mottles; massive; hard, firm, sticky and plastic; dark stains (iron and manganese oxides); about 30 percent shale fragments; many medium and coarse nests of gypsum crystals and other salts; strongly acid; clear wavy boundary.

Cr—50 to 60 inches; olive gray (5Y 5/2) shale, olive (5Y 4/3) moist; very few fine mottles along bedding planes; stains (iron and manganese oxides) on the bedding planes; many medium and coarse nests of gypsum crystals and other salts; very strongly acid.

The depth to shale ranges from 40 to more than 60 inches. During dry periods a white crust of salts, 1/8 to 1/4 inch thick, is at the surface. Some pedons are calcareous throughout.

The A horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 5 or 6 (3 to 5 moist) and chroma of 0 to 2. It dominantly is silty clay loam but in some pedons is clay, silty clay, silt loam, or loam. It is 3 to 19 inches thick. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. It is silty clay loam, silty clay, or clay. A buried soil is below a

depth of 25 inches in some pedons. The Cr horizon is clayey shale, soft siltstone, or soft sandstone. Some pedons do not have clayey shale within a depth of 60 inches.

Savage Series

The Savage series consists of deep, well drained soils formed in clayey alluvium on terraces. Permeability is moderately slow. Slopes range from 0 to 3 percent.

Typical pedon of Savage silty clay loam, 1,800 feet south and 1,800 feet west of the northeast corner of sec. 24, T. 16 N., R. 9 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine and medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many medium and fine roots; slightly acid; clear wavy boundary.

Bt1—6 to 10 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; very hard, firm, sticky and plastic; shiny films on faces of peds; common fine and medium roots; neutral; clear wavy boundary.

Bt2—10 to 15 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; shiny films on faces of peds; common fine compressed roots; neutral; abrupt wavy boundary.

Bt3—15 to 23 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, slightly sticky and plastic; shiny films on faces of peds; few fine accumulations of carbonate; slight effervescence; neutral; clear wavy boundary.

Bk1—23 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, firm, slightly sticky and plastic; few compressed roots; common fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Bk2—30 to 38 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; very few fine roots; common fine and medium accumulations of carbonate; violent effervescence; moderately alkaline; abrupt wavy boundary.

C—38 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; very few fine roots; few fine accumulations of carbonate; violent effervescence; moderately alkaline.

The mollic epipedon ranges from 8 to 16 inches in thickness. It includes the A horizon and all or part of the Bt horizon. The depth to carbonates ranges from 18 to 30 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It dominantly is silty clay loam but in some pedons is silt loam. It is 4 to 6 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It is silty clay loam, silty clay, or clay. The content of clay in this horizon is as low as 35 percent in some pedons and as high as 45 percent in others. Some pedons have a BC horizon. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 to 4. It is silt loam, silty clay loam, or clay loam. Sandy or gravelly material is below a depth of 40 inches in some pedons.

Shambo Series

The Shambo series consists of deep, well drained soils formed in loamy and silty local alluvium on foot slopes and terraces. Permeability is moderate. Slopes range from 2 to 6 percent.

Typical pedon of Shambo loam, 2 to 6 percent slopes, 1,260 feet west and 1,100 feet south of the northeast corner of sec. 4, T. 19 N., R. 8 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure parting to weak fine and medium granular; slightly hard, very friable; many medium and fine roots; slightly acid; clear wavy boundary.

Bw—5 to 15 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium and fine prismatic structure parting to weak medium subangular blocky; hard, friable; many medium and fine roots; neutral; clear wavy boundary.

Bk1—15 to 22 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak coarse and medium prismatic structure parting to weak coarse and medium subangular blocky; hard, friable; few fine roots; few fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

Bk2—22 to 34 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable; few fine roots; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—34 to 50 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable; few fine roots; common fine and medium accumulations of carbonate; strong effervescence; strongly alkaline; gradual wavy boundary.

C2—50 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable; strongly alkaline; strong effervescence.

The depth to carbonates ranges from 14 to 30 inches. The thickness of the mollic epipedon ranges from 7 to 16 inches. An Ab horizon is below a depth of 30 inches in some pedons.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 2. It dominantly is loam but in some pedons is silt loam. It is 5 to 8 inches thick. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 to 4. It is loam or clay loam. The content of clay in this horizon is as low as 18 percent in some pedons and as high as 30 percent in others. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is loam, silt loam, clay loam, or silty clay loam. Some pedons have a 2C horizon below a depth of 40 inches. This horizon is loamy sand or gravelly sand.

Slimbutte Series

The Slimbutte series consists of deep, well drained soils formed in loamy colluvium on uplands. Permeability is moderate or moderately rapid in the solum and rapid in the underlying material. Slopes range from 6 to 60 percent.

Typical pedon of Slimbutte very fine sandy loam, in an area of Slimbutte-Reva complex, 6 to 60 percent slopes, 1,740 feet east and 1,140 feet north of the southwest corner of sec. 8, T. 18 N., R. 8 E.

A—0 to 5 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable; many fine and medium roots; about 15 percent sandstone pebbles; neutral; clear wavy boundary.

Bw1—5 to 12 inches; gray (10YR 5/1) gravelly very fine sandy loam, very dark gray (2.5Y 3/1) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; soft, friable; many fine and medium roots; about 30 percent sandstone fragments; mildly alkaline; clear wavy boundary.

Bw2—12 to 17 inches; grayish brown (10YR 5/2) very gravelly very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; soft, very friable; common fine and medium roots; about 35 percent coarse fragments of sandstone; rock fragments coated with carbonates; interiors are noncalcareous; slight effervescence in the matrix; mildly alkaline; gradual wavy boundary.

Bk—17 to 24 inches; light brownish gray (2.5Y 6/2) very gravelly very fine sandy loam, grayish brown (2.5Y 5/2) moist; weak medium and fine subangular blocky structure; soft, very friable; few fine and medium compressed roots; about 40 percent coarse fragments of sandstone; rock fragments coated with carbonates; interiors are noncalcareous; strong effervescence in the matrix; mildly alkaline; clear wavy boundary.

C1—24 to 31 inches; light gray (5Y 6/1) very gravelly very fine sandy loam, dark gray (5Y 4/1) moist; massive; soft, very friable; common fine and medium compressed roots; about 40 percent coarse fragments of sandstone; rock fragments coated with carbonates; interiors are noncalcareous; strong effervescence in the matrix; mildly alkaline; clear wavy boundary.

C2—31 to 43 inches; white (5Y 8/2) very cobbly fine sandy loam, olive (5Y 5/4) moist; massive; soft, very friable; few fine and medium compressed roots; about 55 percent coarse fragments; rock fragments coated with carbonates; interiors are noncalcareous; strong effervescence in the matrix; moderately alkaline; diffuse irregular boundary.

C3—43 to 60 inches; white (5Y 8/2) cobbles, stones, and pebbles, olive (5Y 4/4) moist; very few fine compressed roots; rock fragments coated with carbonates; interiors are noncalcareous; moderately alkaline.

The depth to carbonates ranges from 10 to 16 inches. The thickness of the mollic epipedon ranges from 7 to 16 inches. Some pedons have a 1- to 2-inch layer of partially decomposed forest and grass litter at the surface. Typically, little or no fine-earth material is in the voids between the rock fragments below a depth of 40 inches. Some pedons have fractured, hard sandstone below a depth of 40 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is very fine sandy loam but in some pedons is loam, silt loam, gravelly silt loam, gravelly loam, or gravelly very fine sandy loam. It is 4 to 6 inches thick.

The Bw horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 1 to 3. It is gravelly very fine sandy loam, very gravelly very fine sandy loam, silt loam, or loam. The content of rock fragments in this horizon ranges from 30 to 50 percent. In some pedons the lower part of this horizon has no carbonates.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8 (4 to 6 moist), and chroma of 1 to 4. It is loam, sandy loam, or very fine sandy loam. The content of rock fragments in this horizon ranges from 35 to 95 percent.

Swanboy Series

The Swanboy series consists of deep, well drained soils formed in clayey alluvium on foot slopes and terraces. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is very slow. Slopes range from 0 to 9 percent.

Typical pedon of Swanboy clay, 0 to 9 percent slopes, 1,100 feet west and 20 feet south of the northeast corner of sec. 16, T. 15 N., R. 1 E.

A—0 to 2 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; slight effervescence; moderately alkaline; clear wavy boundary.

Bw—2 to 7 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; moderate coarse subangular blocky structure parting to moderate medium and fine subangular blocky; very hard, very firm, sticky and plastic; few intersecting slickensides; few fine compressed roots; slight effervescence; moderately alkaline; gradual wavy boundary.

Bz—7 to 11 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; moderate coarse subangular blocky structure; very hard, very firm, sticky and plastic; few intersecting slickensides; few fine roots; slight effervescence; common fine nests of gypsum crystals and other salts; mildly alkaline; gradual irregular boundary.

Cz1—11 to 40 inches; pale olive (5Y 6/3) clay, olive (5Y 5/3) moist; massive; very hard, firm, sticky and plastic; few intersecting slickensides in the upper 12 inches; few fine compressed roots; slight effervescence; many medium nests of gypsum crystals and other salts; moderately alkaline; clear irregular boundary.

Cz2—40 to 46 inches; olive (5Y 5/3) clay, olive (5Y 5/3) moist; massive; very hard, firm, sticky and plastic; strong effervescence; common medium nests of gypsum crystals and other salts; moderately alkaline; gradual irregular boundary.

Cz3—46 to 60 inches; olive (5Y 5/3) clay, olive (5Y 5/3) moist; massive; very hard, firm, sticky and plastic; slight effervescence; many medium nests of gypsum crystals and other salts; mildly alkaline.

Some pedons do not have carbonates in the upper 9 inches. The A horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It is 0.5 inch to 2.0 inches thick. It is clay or silty clay. The B horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3.

Tanna Series

The Tanna series consists of moderately deep, well drained soils formed in silty and loamy residuum on uplands. Permeability is slow. Slopes range from 0 to 9 percent.

Typical pedon of Tanna silty clay loam, 2 to 9 percent slopes, 1,320 feet west and 825 feet south of the northeast corner of sec. 31, T. 15 N., R. 2 E.

A—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; many fine roots; neutral; clear wavy boundary.

Bt1—6 to 9 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; common fine and medium roots; shiny films on faces of peds; neutral; clear wavy boundary.

Bt2—9 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common fine and medium roots; shiny films on faces of peds; mildly alkaline; abrupt wavy boundary.

Bk1—12 to 19 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; common fine roots; few fine accumulations of carbonate; slight effervescence; moderately alkaline; clear wavy boundary.

Bk2—19 to 26 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, firm, sticky and plastic; common fine roots; common medium distinct olive yellow (2.5Y 6/6) stains (iron and manganese oxides); few fine accumulations of carbonate; slight effervescence; moderately alkaline; clear wavy boundary.

C—26 to 36 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine faint olive yellow (2.5Y 6/6) stains (iron and manganese oxides); many small fragments of soft sandstone; very few accumulations of carbonate; slight effervescence; moderately alkaline; clear wavy boundary.

Cr1—36 to 46 inches; pale yellow (2.5Y 7/4), weakly consolidated sandstone, light olive brown (2.5Y 5/4) moist; very few fine roots along cracks and bedding planes; strongly alkaline; abrupt wavy boundary.

Cr2—46 to 60 inches; pale yellow (2.5Y 7/4), weakly consolidated sandstone and alternating lenses of grayish brown (2.5Y 5/2) clayey shale, light olive brown (2.5Y 5/4) moist (sandstone) and dark grayish brown (2.5Y 4/2) moist (shale); very few fine roots along bedding planes and cracks; strongly alkaline.

The depth to bedrock ranges from 20 to 40 inches. The mollic epipedon is 7 to 12 inches thick. The depth to carbonates is 11 to 18 inches.

The A horizon has hue of 10YR, value of 4 or 5 (3 moist), and chroma of 2 or 3. It is 5 to 7 inches thick.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 or 4 moist), and chroma of 2 to 4. It is silty clay loam or silty clay. The content of clay in this horizon is as low as 35 percent in some pedons and as high as 45 percent in others. Some pedons do not have a Bk horizon.

The C horizon has hue of 2.5Y, value of 6 or 7 (4 to 6 moist), and chroma of 2 to 4. It is silt loam, loam, silty clay loam, or silty clay. In some pedons it does not have carbonates. Some pedons do not have a C horizon.

The Cr horizon has hue of 10YR or 2.5Y, value of 4 to 7 (3 to 6 moist), and chroma of 1 to 4. It is soft siltstone or sandstone that has bands of clayey shale a few inches to many feet thick. Some layers are calcareous.

Trey Series

The Trey series consists of moderately deep, well drained soils formed in sandy residuum on uplands. Permeability is rapid. Slopes range from 2 to 50 percent.

Typical pedon of Trey loamy fine sand, 2 to 9 percent slopes, 1,850 feet east and 1,320 feet south of the northwest corner of sec. 1, T. 18 N., R. 4 E.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure parting to single grain; soft, loose; common medium and fine roots; neutral; clear wavy boundary.

AC—4 to 10 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to single grain; soft, loose; common medium and fine roots; neutral; clear wavy boundary.

C1—10 to 19 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; soft, loose; few fine and medium roots; neutral; clear wavy boundary.

C2—19 to 30 inches; grayish brown (2.5Y 5/2) fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few fine and medium roots; neutral; clear wavy boundary.

Cr1—30 to 38 inches; grayish brown (2.5Y 5/2), soft sandstone, dark grayish brown (2.5Y 4/2) moist; few fine roots penetrating the bedrock; neutral; clear wavy boundary.

Cr2—38 to 47 inches; light brownish gray (2.5Y 6/2), soft sandstone, grayish brown (2.5Y 5/2) moist; very few fine roots along seams and bedding planes; mildly alkaline; clear wavy boundary.

Cr3—47 to 60 inches; light gray (2.5Y 7/2), soft sandstone, grayish brown (2.5Y 5/2) moist; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The depth to bedrock ranges from 20 to 40 inches. The A horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2. It dominantly is loamy fine sand but in some pedons is loamy sand. It is 2 to 4 inches thick. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 4. It is loamy fine sand, loamy sand, fine sand, or sand. The Cr horizon has hue of 10YR, 2.5Y or 5Y, value of 4 to 7 (2 to 6 moist), and chroma of 1 to 6. It is soft sandstone, siltstone, or clayey shale. Some layers are hard but fractured. Some pedons are noncalcareous throughout.

Twilight Series

The Twilight series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Permeability is moderately rapid. Slopes range from 6 to 25 percent.

Typical pedon of Twilight fine sandy loam, in an area of Twilight-Parchin fine sandy loams, 6 to 15 percent slopes, 1,020 feet north and 755 feet west of the southeast corner of sec. 29, T. 20 N., R. 3 E.

A—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; many fine roots; neutral; clear wavy boundary.

Bw1—4 to 8 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, very friable; many fine roots; slightly acid; clear wavy boundary.

Bw2—8 to 12 inches; yellowish brown (10YR 5/4) fine sandy loam, brown (10YR 4/3) moist; weak coarse and medium prismatic structure parting to weak coarse and medium subangular blocky; slightly hard, very friable; common fine roots; slightly acid; clear wavy boundary.

BC—12 to 22 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, very friable; common fine roots; neutral; gradual wavy boundary.

C—22 to 30 inches; light olive brown (2.5Y 5/4) sandy loam, olive brown (2.5Y 4/4) moist; weak coarse

subangular blocky structure; slightly hard, very friable; few fine roots; mildly alkaline; abrupt wavy boundary.

Cr1—30 to 42 inches; light olive brown (2.5Y 5/4), soft sandstone, olive brown (2.5Y 4/4) moist; few fine roots along seams and bedding planes; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cr2—42 to 50 inches; grayish brown (2.5Y 5/2), soft sandstone, dark grayish brown (2.5Y 4/2) moist; few fine roots along seams and bedding planes; few medium fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cr3—50 to 60 inches; grayish brown (2.5Y 5/2) shale, dark grayish brown (2.5Y 4/2) moist; few fine roots along seams and bedding planes; many coarse accumulations of carbonate; strong effervescence; strongly alkaline.

The depth to bedrock ranges from 20 to 40 inches. The A and Bw horizons are fine sandy loam or sandy loam. The A horizon has hue of 10YR, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It is 2 to 4 inches thick. The Bw horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. The C and Cr horizons have hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 4. The C horizon is sandy loam, fine sandy loam, or loamy fine sand. It is calcareous in some pedons. The Cr horizon is soft sandstone or siltstone interbedded with thin layers of shale. Some layers are noncalcareous.

Twotop Series

The Twotop series consists of deep, well drained soils formed in clayey alluvium on terraces and upland fans. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is very slow. Slopes range from 0 to 3 percent.

Typical pedon of Twotop clay, 0 to 3 percent slopes, 1,300 feet west and 320 feet south of the northeast corner of sec. 24, T. 15 N., R. 2 E.

A—0 to 4 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; vesicular crust in the upper 0.5 inch; weak medium subangular blocky structure in the lower part; very hard, firm, sticky and plastic; common fine compressed roots; mildly alkaline; clear wavy boundary.

Bw1—4 to 9 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few compressed roots; slight effervescence; mildly alkaline; clear wavy boundary.

Bw2—9 to 17 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak coarse and medium subangular blocky structure; very hard, firm, sticky and plastic; few fine compressed roots; few intersecting slickensides; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual irregular boundary.

Bkz—17 to 30 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine compressed roots; few intersecting slickensides; many medium and fine nests of gypsum crystals and other salts; many fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual irregular boundary.

C1—30 to 36 inches; olive gray (5Y 5/2) silty clay, olive gray (5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few fine compressed roots; few fine accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

C2—36 to 43 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; few fine compressed roots; common medium accumulations of carbonate; strong effervescence; common medium and fine nests of gypsum crystals and other salts; mildly alkaline; clear wavy boundary.

C3—43 to 52 inches; light olive gray (5Y 6/2) silty clay, olive (5Y 5/3) moist; massive; very hard, firm, sticky and plastic; few medium accumulations of carbonate; strong effervescence; few medium nests of gypsum crystals; mildly alkaline; clear wavy boundary.

C4—52 to 60 inches; olive gray (5Y 5/2) clay, olive gray (5Y 5/2) moist; massive; extremely hard, firm, sticky and plastic; slight effervescence; common medium nests of gypsum; mildly alkaline.

Some pedons do not have carbonates within a depth of 9 inches.

The A horizon has hue of 2.5Y or 5Y, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3. It is 2 to 5 inches thick. A vesicular crust, 0.25 to 1.0 inch thick, is at the surface. The Bw horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4.

Vanocker Series

The Vanocker series consists of deep, well drained soils formed in loamy sandstone residuum on uplands. Permeability is moderate. Slopes range from 6 to 60 percent.

These soils contain less clay in the subsoil and have a yellower hue than is definitive for the series. These

differences, however, do not significantly alter the usefulness or behavior of the soils.

Typical pedon of Vanocker gravelly loam, in an area of Vanocker-Reva complex, 6 to 60 percent slopes, 2,085 feet north and 1,020 feet east of the southwest corner of sec. 8, T. 18 N., R. 8 E.

O—2 inches to 0; very dark gray (10YR 3/1), partially decomposed forest and grass litter, black (10YR 2/1) moist; medium acid; abrupt wavy boundary.

A—0 to 2 inches; dark gray (10YR 4/1) gravelly loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable; many medium and fine roots; about 20 percent pebbles of hard sandstone; medium acid; abrupt wavy boundary.

Bw1—2 to 7 inches; light olive gray (5Y 6/2) gravelly loam, dark olive gray (5Y 3/2) moist; weak fine prismatic structure parting to weak medium subangular blocky; soft, friable; common fine and medium roots; about 25 percent pebbles and fragments of hard sandstone; medium acid; clear wavy boundary.

Bw2—7 to 12 inches; light olive gray (5Y 6/2) gravelly loam, olive gray (5Y 4/2) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; about 25 percent pebbles and fragments of hard sandstone; medium acid; clear irregular boundary.

BC1—12 to 16 inches; light gray (5Y 7/1) gravelly loam, olive gray (5Y 4/2) moist; weak medium and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and medium roots; about 35 percent pebbles, fragments, and cobbles of hard sandstone; strong effervescence; mildly alkaline; gradual irregular boundary.

BC2—16 to 22 inches; white (5Y 8/1) very gravelly loam, olive (5Y 4/4) moist; weak medium and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine roots; about 40 percent fragments of hard sandstone; strong effervescence; mildly alkaline; gradual irregular boundary.

C1—22 to 30 inches; white (5Y 8/1) very gravelly loam, olive (5Y 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; very few fine roots; about 40 percent pebbles, fragments, and cobbles of hard sandstone; strong effervescence; mildly alkaline; abrupt wavy boundary.

C2—30 to 60 inches; white (5Y 8/1) very cobbly loam, olive (5Y 5/3) moist; about 50 percent coarse fragments and cobbles of hard sandstone; moderately alkaline.

The depth to carbonates ranges from 12 to 20 inches. The depth to hard sandstone ranges from 40 to 60 inches.

The O horizon is 0.5 inch to 3.0 inches thick. The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is gravelly loam but in some pedons is gravelly silt loam. It is 1 to 3 inches thick. The Bw horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6 (3 to 5 moist), and chroma of 1 to 3. It is gravelly loam or cobbly loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8 (4 to 7 moist), and chroma of 1 to 4. It is very gravelly, very cobbly, or very channery loam.

Vebar Series

The Vebar series consists of moderately deep, well drained soils formed in loamy residuum on uplands. Permability is moderately rapid. Slopes range from 2 to 25 percent.

Typical pedon of Vebar fine sandy loam, in an area of Vebar-Cohagen fine sandy loams, 9 to 25 percent slopes, 2,325 feet north and 1,033 feet east of the southwest corner of sec. 36, T. 23 N., R. 4 E.

A—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; many fine roots; slightly acid; clear wavy boundary.

Bw1—7 to 13 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; soft, very friable; common fine roots; neutral; clear wavy boundary.

Bw2—13 to 20 inches; light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to weak coarse and medium subangular blocky; soft, very friable; common fine roots; neutral; abrupt wavy boundary.

Bk1—20 to 26 inches; light brownish gray (2.5Y 6/2) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; few fine roots; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Bk2—26 to 32 inches; light brownish gray (2.5Y 6/2) fine sandy loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; slightly hard, very friable; few fine roots; many fine accumulations of carbonate; few fine nests of gypsum crystals; strong effervescence; mildly alkaline; clear wavy boundary.

Cr1—32 to 55 inches; light brownish gray (2.5Y 6/2), soft sandstone, grayish brown (2.5Y 5/2) moist; few fine roots along seams and cracks; strong effervescence; moderately alkaline; clear wavy boundary.

Cr2—55 to 60 inches; light gray (5Y 7/2), soft sandstone, olive gray (5Y 5/2) moist; strong effervescence; moderately alkaline.

The thickness of the mollic epipedon ranges from 7 to 16 inches. The depth to carbonates ranges from 15 to 30 inches. The depth to soft bedrock ranges from 20 to 40 inches.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It is 5 to 9 inches thick. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 to 4. It is fine sandy loam or sandy loam. Some pedons have a C horizon. Some layers in the Cr horizon are noncalcareous.

Watrous Series

The Watrous series consists of moderately deep, well drained soils formed in loamy material weathered from hard sandstone on uplands. Permeability is moderate. Slopes range from 2 to 6 percent.

Typical pedon of Watrous loam, in an area of Watrous-Werner loams, 2 to 6 percent slopes, 1,675 feet south and 1,130 feet west of the northeast corner of sec. 5, T. 16 N., R. 2 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; many fine roots; slightly acid; clear smooth boundary.

A2—4 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; soft, very friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—8 to 11 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable; shiny films on faces of peds; common fine roots; slightly acid; clear smooth boundary.

Bt2—11 to 17 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable; shiny films on faces of peds; few fine roots; neutral; clear smooth boundary.

Bk—17 to 23 inches; white (2.5Y 8/2) loam, light gray (2.5Y 7/2) moist; weak medium subangular blocky structure; slightly hard, friable, plastic; few fine roots; about 5 percent fragments of sandstone; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C—23 to 30 inches; white (2.5Y 8/2) loam, light gray (2.5Y 7/2) moist; massive; slightly hard, firm; very few fine roots; about 15 percent fragments of sandstone less than 3 inches in size; few fragments of sandstone more than 3 inches in size; strong effervescence; moderately alkaline; clear smooth boundary.

R—30 to 60 inches; very pale brown (10YR 8/3), hard sandstone, pale brown (10YR 6/3) moist; fractured in the upper part; moderately alkaline.

The depth to hard bedrock ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 7 to 16 inches.

The A horizon has hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 2. It dominantly is loam but in some pedons is silt loam. It is 5 to 8 inches thick. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 to 4. The Bt and C horizons are loam, clay loam, or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 6 to 8 (5 to 7 moist), and chroma of 2 to 4. The R horizon has hue of 10YR, 2.5Y, or 5Y, value of 6 to 8 (5 to 7 moist), and chroma of 1 to 4. Some layers of the bedrock are noncalcareous.

Werner Series

The Werner series consists of shallow, well drained soils formed in sandstone residuum on uplands. Permeability is moderate. Slopes range from 2 to 9 percent.

Typical pedon of Werner loam, in an area of Amor-Werner loams, 2 to 6 percent slopes, 800 feet east and 100 feet north of the southwest corner of sec. 6, T. 22 N., R. 9 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; common fine fragments of hard sandstone; slight effervescence; mildly alkaline; abrupt wavy boundary.

AC—6 to 13 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; soft, very friable; few fine fragments of hard sandstone; strong effervescence; mildly alkaline; clear wavy boundary.

Cr1—13 to 24 inches; white (2.5Y 8/2) sandstone, light brownish gray (2.5Y 6/2) moist; sandstone fragments are coated with carbonates; strong effervescence; mildly alkaline; abrupt wavy boundary.

Cr2—24 to 30 inches; grayish brown (2.5Y 5/2) sandstone, very dark gray (2.5Y 3/1) moist; fine streaks of carbonates; strong effervescence; mildly alkaline; abrupt wavy boundary.

Cr3—30 to 60 inches; light gray (2.5Y 7/2), grayish brown (2.5Y 5/2), and light olive gray (5Y 6/2) sandstone, grayish brown (2.5Y 5/2), olive yellow (2.5Y 6/6), and olive (5Y 5/3) moist; strong effervescence; moderately alkaline.

The depth to sandstone ranges from 10 to 20 inches. The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3. It dominantly is loam but in some pedons is very fine sandy loam. It is 5 to 8 inches thick. It typically is noncalcareous, but some pedons in plowed areas are calcareous at the surface. The Cr horizon is fine grained sandstone that consists of plates 0.5 inch to 3.0 inches thick.

Winler Series

The Winler series consists of moderately deep, well drained soils formed in clayey residuum on uplands. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is very slow. Slopes range from 2 to 15 percent.

Typical pedon of Winler clay, in an area of Winler-Lismas clays, 2 to 15 percent slopes, 1,975 feet west and 1,560 feet south of the northeast corner of sec. 32, T. 15 N., R. 3 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; very hard, firm, sticky and plastic; common fine compressed roots; slightly acid; clear wavy boundary.

Bw—3 to 11 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few intersecting slickensides; common fine compressed roots; neutral; clear wavy boundary.

Bz—11 to 16 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few interesecting slickensides; few fine compressed roots; many fine and medium nests of gypsum crystals; neutral; clear wavy boundary.

C—16 to 25 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, sticky and plastic; common fine fragments of shale; very few fine compressed roots; common fine nests of gypsum crystals; neutral; diffuse wavy boundary.

Cr1—25 to 48 inches; light brownish gray (2.5Y 6/2) clayey shale, grayish brown (2.5Y 5/2) moist; few large nests of olive yellow (2.5Y 6/6) gypsum crystals; very few fine compressed roots along bedding planes; neutral; diffuse smooth boundary.

Cr2—48 to 60 inches; light brownish gray (2.5Y 6/2) clayey shale, grayish brown (2.5Y 5/2) moist; many large nests of gypsum crystals; neutral.

The depth to shale ranges from 20 to 40 inches. Some pedons are calcareous in the lower part of the B horizon and in the C and Cr horizons. The depth to visible salts ranges from 8 to 15 inches.

The A horizon has hue of 2.5Y or 5Y, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It is 3 to 5 inches thick. The Bw and C horizons have hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. Some pedons do not have a C horizon. The Cr horizon has hue of 2.5Y or 5Y, value of 4 to 6 (4 or 5 moist), and chroma of 2 or 3.

Zeona Series

The Zeona series consists of deep, excessively drained soils formed in sandy eolian material on uplands. Permeability is rapid. Slopes range from 2 to 25 percent.

Typical pedon of Zeona loamy fine sand, in an area of Zeona-Parchin complex, 2 to 9 percent slopes, 2,355 feet south and 845 feet west of the northeast corner of sec. 26, T. 19 N., R. 4 E.

A—0 to 3 inches; dark grayish brown (2.5Y 4/2) loamy fine sand, very dark grayish brown (2.5Y 3/2) moist; single grain; soft, loose; many roots; neutral; clear smooth boundary.

C1—3 to 8 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; common roots; neutral; gradual wavy boundary.

C2—8 to 60 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few roots; neutral.

The depth to carbonates typically is more than 36 inches. The A horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 or 3. It is 2 to 5 inches thick. It is loamy fine sand or fine sand. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 to 4.

Formation of the Soils

Soil forms when chemical and physical processes act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are modified by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil having genetically related horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Harding County.

Climate

Climate directly influences the rate of chemical and physical weathering. Harding County has a continental climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. It also favors a moderately slow rate of weathering or soil formation. The climate generally is uniform throughout the county. The eastern part of the county, however, receives somewhat more precipitation than the western part. As a result, the surface layer of the soils in the eastern part generally is somewhat thicker and darker than that of the soils in the western part. Detailed climatic data are given under the heading "General Nature of the County."

Plant and Animal Life

Plants, animals, insects, earthworms, bacteria, and fungi have important effects on soil formation. They cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity. In Harding County the prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer of many soils has a moderate or high content of organic matter. Arnegard soils are an example of soils that have a high content of organic matter.

Earthworms, insects, and burrowing animals help to keep the soils open and porous. Bacteria and fungi decompose plant residue, thus releasing plant nutrients.

Parent Material

Parent material is the unconsolidated organic and mineral material in which a soil forms. It determines many of the chemical and physical characteristics of the soil, such as color, texture, reaction, and consistence. The rate of soil formation is more rapid in the more friable, loamy and silty parent material than in other kinds of parent material. Also, more changes take place, and the horizons are more distinct.

Most of the soils in Harding County formed in material weathered from the underlying bedrock. The rest formed in old alluvial deposits on high terraces or in recent alluvial deposits on flood plains, in swales, and in depressions on uplands.

The bedrock in the southwestern part of the county dominantly is clayey shale of the Pierre Formation. It is gray to light olive gray and has beds of bentonite and seams of limestone, iron, and manganese concretions. Lismas and Winler are examples of soils that formed in material weathered from the Pierre Formation.

The bedrock in the western part of the county is mainly soft sandstone and siltstone of the Fox Hills and Hell Creek Formations. The Hell Creek Formation overlies the Fox Hills Formation and is the more extensive of the two. Blackhall, Parchin, Rhame, and Twilight are examples of soils that formed in material weathered from the sandstone beds of the Hell Creek Formation. Marmarth and Cabbart are examples of soils that formed in material weathered from the Fox Hills Formation.

The Ludlow and Fort Union Formations are directly above the Hell Creek Formation. They are most extensive in the northeastern part of the county. They consist of interbedded soft sandstone, siltstone, and clayey shale. Many areas have thin layers of lignite.

Outcrops of porcellanite are in areas of these formations. Amor, Cabba, Lantry, and Reeder are examples of soils that formed in material weathered from these formations. Kirby soils formed in material weathered from porcellanite.

The Arikaree and Chadron Formations form the caprock of the East and West Short Pines, which are in the western part of the county, and the Slim Buttes, which are in the eastern part. The Arikaree Formation is above the Chadron Formation and forms the high vertical escarpments in these areas. It consists of hard sandstone that is highly fractured in the upper part. The Chadron Formation consists of easily weathered siltstone. Reva and Watrous are examples of soils that formed in material weathered from the Arikaree Formation. Vanocker soils formed in material weathered from the Chadron Formation.

The alluvium in Harding County either is recently deposited sandy to clayey material on flood plains or is older deposits of loamy material on high terraces. Glendive, Hanly, Harlem, and Havre are examples of soils that formed in alluvium on flood plains. Assinniboine, Chinook, and Kremlin are examples of soils that formed in alluvium on high terraces. Arnegard and Heil are examples of soils that formed partly or entirely in local alluvium washed in from the more sloping adjacent soils in the uplands. Attewan and Nihill Variant soils formed in alluvium on terraces and terrace scarps. They are loamy and are underlain by sand and gravel.

Relief

Relief affects soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. On the more sloping soils, such as Blackhall, Cabba, and Cabbart soils, much of the rainfall is lost through runoff. As a result of the excessive runoff, a limited amount of moisture penetrates the surface and much of the soil is lost through erosion. These soils have a thin surface layer and a low content of organic matter. Runoff is slower on Assinniboine, Eapa, Chinook, and other less sloping soils, and more water penetrates the surface. As a result, the horizons in which organic matter accumulates are thicker.

The Arnegard soils in swales and on flats receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in the slightly higher Eapa soils. In low areas where drainage is impeded, a fluctuating water table favors the concentration of salts in some soils, such as Dogiecreek and Sage. Heil soils are in depressions and are subject to ponding. They have the colors characteristic of poorly drained soils.

Time

The length of time that soil material has been exposed to the other four factors of soil formation is reflected in the kinds of soil that have formed. Generally, the degree of profile development reflects the age of a soil. The oldest soils are on the parts of the landscape that have been stable for the longest time. In Harding County these are the Reeder and Watrous soils, which have distinct horizons. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are soils that formed in alluvium in areas that receive new material each time they are flooded. Glendive and Korchea are examples of young soils that formed in alluvium. Cabba and Lismas are examples of young soils that are subject to natural erosion.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour farming. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed native range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. The thickness of weathered soil material over bedrock. The depth classes recognized in this survey are—

	Inches
Deep	more than 40
Moderately deep	20 to 40
Shallow	less than 20

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Increasers. Species that respond to continued overgrazing, at least initially, by increasing in relation to other plants in the community.

Invaders. On range, plants that are not a part of the original plant community that encroach into an area and grow after the native vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface soil.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can

be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical

distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The slope classes recognized in this survey area are as follows:

	Percent
Level	0 to 1
Nearly level	0 to 2
Gently undulating	0 to 3
Very gently sloping	0 to 4
Gently sloping or undulating	2 to 6
Moderately sloping or gently rolling	6 to 9
Strongly sloping or rolling	9 to 15
Moderately steep or hilly	15 to 25
Steep	25 to 40
Very steep	40 or more

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-80 at Redig, South Dakota)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	26.7	3.3	15.0	56	-30	0	0.30	0.09	0.47	1	6.1
February---	33.0	9.6	21.3	63	-25	0	.41	.14	.62	2	7.5
March------	40.6	17.1	28.9	74	-19	15	.61	.17	.96	2	7.1
April------	55.5	29.5	42.5	84	9	28	1.40	.45	2.19	4	5.3
May--------	67.4	40.3	53.9	90	22	159	2.52	1.06	3.74	7	1.0
June-------	76.6	49.8	63.2	98	34	396	3.28	1.84	4.54	8	.2
July-------	85.7	55.0	70.4	103	40	632	2.01	.96	2.91	5	.0
August-----	85.0	53.1	69.1	102	38	592	1.67	.52	2.59	4	.0
September--	73.7	42.1	57.9	98	21	263	1.01	.19	1.63	3	.2
October----	61.7	31.9	46.8	88	10	71	.79	.17	1.28	2	1.8
November---	43.5	18.9	31.2	73	-11	0	.40	.10	.63	2	5.3
December---	33.1	9.7	21.4	61	-26	0	.31	.05	.50	1	5.6
Yearly:											
Average--	56.9	30.0	43.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	105	-30	---	---	---	---	---	---
Total----	---	---	---	---	---	2,156	14.71	---	---	41	40.1

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-80 at Redig, South Dakota)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 13	May 24	June 8
2 years in 10 later than--	May 8	May 19	June 2
5 years in 10 later than--	Apr. 29	May 9	May 22
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 14	Sept. 6	Sept. 6
2 years in 10 earlier than--	Sept. 20	Sept. 11	Sept. 9
5 years in 10 earlier than--	Oct. 2	Sept. 23	Sept. 16

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-80 at Redig, South Dakota)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	134	118	98
8 years in 10	141	124	104
5 years in 10	155	136	117
2 years in 10	170	147	129
1 year in 10	177	153	135

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AaA	Amor loam, 0 to 2 percent slopes	1,805	0.1
AaB	Amor loam, 2 to 6 percent slopes	11,965	0.7
AcC	Amor-Cabba loams, 6 to 9 percent slopes	80,335	4.7
AdC	Amor-Rhoades loams, 6 to 9 percent slopes	10,135	0.6
AeB	Amor-Werner loams, 2 to 6 percent slopes	3,765	0.2
AkA	Archin-Bullock fine sandy loams, 0 to 4 percent slopes	38,960	2.3
Ar	Arnegard loam	3,695	0.2
AsA	Assinniboine fine sandy loam, 0 to 3 percent slopes	2,310	0.1
AsB	Assinniboine fine sandy loam, 3 to 6 percent slopes	6,025	0.4
AtA	Assinniboine-Archin fine sandy loams, 0 to 3 percent slopes	11,260	0.7
AwB	Attewan loam, 2 to 6 percent slopes	5,265	0.3
Ba	Badlands	14,090	0.8
BeC	Boxwell loam, 6 to 9 percent slopes	820	*
BkF	Bullock fine sandy loam, 6 to 20 percent slopes, extremely stony	2,265	0.1
BnA	Bullock-Assinniboine fine sandy loams, 0 to 4 percent slopes	2,405	0.1
BoD	Bullock-Cabbart complex, 6 to 25 percent slopes	107,821	6.4
BpB	Bullock-Parchin-Slickspots complex, 2 to 9 percent slopes	71,730	4.2
BsA	Bullock-Slickspots complex, 0 to 4 percent slopes	15,125	0.9
CaD	Cabba-Lantry-Amor loams, 9 to 25 percent slopes	82,445	4.8
CbD	Cabba-Reeder loams, 9 to 25 percent slopes	8,700	0.5
CcE	Cabbart loam, 6 to 60 percent slopes, extremely stony	11,160	0.7
CdE	Cabbart-Delridge loams, 15 to 40 percent slopes	25,425	1.5
CeE	Cabbart-Rock outcrop complex, 15 to 40 percent slopes	69,610	4.1
ChA	Chinook fine sandy loam, 0 to 3 percent slopes	6,680	0.4
CnA	Chinook-Archin fine sandy loams, 0 to 3 percent slopes	17,190	1.0
CoE	Cohagen fine sandy loam, 15 to 50 percent slopes	44,125	2.6
CrF	Cohagen-Rock outcrop-Cabba Variant complex, 3 to 100 percent slopes	11,320	0.7
DcC	Delridge-Cabbart loams, 6 to 15 percent slopes	9,525	0.6
Du	Dumps, mine	655	*
Dw	Dune land	855	*
EaA	Eapa loam, 0 to 3 percent slopes	4,890	0.3
EcA	Eapa-Archin complex, 0 to 3 percent slopes	6,245	0.4
FaB	Farnuf loam, 2 to 6 percent slopes	7,695	0.4
FtE	Fleak-Trey-Rock outcrop complex, 15 to 50 percent slopes	6,135	0.4
GdA	Gerdrum silt loam, 0 to 4 percent slopes	20,185	1.2
Ge	Glendive fine sandy loam	9,515	0.6
GhB	Glendive-Archin fine sandy loams, 2 to 6 percent slopes	2,185	0.1
GkA	Grail silt loam, 0 to 3 percent slopes	825	*
GrA	Grail-Daglum complex, 0 to 3 percent slopes	3,880	0.2
Ha	Hanly fine sandy loam	3,340	0.2
Hb	Hanly loamy fine sand	7,505	0.4
Hd	Hanly-Dogiecreek fine sandy loams	19,605	1.1
He	Hanly-Slickspots complex	3,475	0.2
Hf	Harlem silty clay, channeled	2,010	0.1
Hg	Havre loam	3,685	0.2
Hh	Havre-Harlem complex	4,495	0.3
Hk	Heil silt loam	1,660	0.1
HsB	Hisle-Slickspots complex, 0 to 6 percent slopes	1,960	0.1
KcF	Kirby-Cabbart-Rock outcrop complex, 15 to 60 percent slopes	3,490	0.2
Ke	Korchea loam	1,975	0.1
Kg	Korchea loam, channeled	19,080	1.1
Km	Korchea-Archin complex	7,440	0.4
KoA	Kremlin loam, 0 to 3 percent slopes	3,020	0.2
KrA	Kremlin-Archin complex, 0 to 3 percent slopes	4,280	0.2
KyB	Kyle clay, 2 to 6 percent slopes	815	*
Le	Lallie silty clay loam	595	*
LhD	Lismas-Hisle complex, 6 to 25 percent slopes	2,745	0.2
LkD	Lismas-Winler clays, 6 to 25 percent slopes	13,185	0.8
LrF	Lismas-Rock outcrop complex, 15 to 60 percent slopes	2,260	0.1
MaB	Marmarth fine sandy loam, 2 to 6 percent slopes	6,165	0.4
McC	Marmarth-Cabbart complex, 6 to 9 percent slopes	6,435	0.4
MpB	Marmarth-Parchin fine sandy loams, 2 to 6 percent slopes	31,960	1.9
MtC	Marmarth-Twilight fine sandy loams, 6 to 9 percent slopes	11,005	0.6

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
MtD	Marmarth-Twilight fine sandy loams, 9 to 15 percent slopes	4,565	0.3
NaD	Nihill Variant-Attewan complex, 4 to 40 percent slopes	4,920	0.3
PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes	146,790	8.6
PhA	Parshall fine sandy loam, 0 to 3 percent slopes	12,600	0.7
Pt	Pits, gravel	190	*
RbB	Reeder loam, 2 to 6 percent slopes	13,205	0.8
RcC	Reeder-Cabba loams, 6 to 9 percent slopes	24,280	1.4
ReB	Reeder-Rhoades loams, 2 to 6 percent slopes	17,915	1.0
RfE	Reva-Slimbutte complex, 9 to 70 percent slopes	2,970	0.2
RgE	Reva-Rock outcrop complex, 15 to 70 percent slopes	7,190	0.4
RhB	Rhame fine sandy loam, 2 to 6 percent slopes	23,800	1.4
RmB	Rhame-Parchin fine sandy loams, 2 to 6 percent slopes	55,375	3.2
RnA	Rhoades-Daglum loams, 0 to 2 percent slopes	11,425	0.7
RnB	Rhoades-Daglum loams, 2 to 9 percent slopes	52,260	3.0
RoF	Rock outcrop	885	0.1
RrF	Rock outcrop-Reva complex, 15 to 60 percent slopes	10,690	0.6
RsF	Rockoa-Reva complex, 6 to 60 percent slopes	2,345	0.1
SaA	Sage loam	12,180	0.7
SbA	Sage-Hisle Variant complex, 0 to 2 percent slopes	1,995	0.1
SgA	Savage silty clay loam	1,365	0.1
ShB	Shambo loam, 2 to 6 percent slopes	8,610	0.5
SmB	Shambo-Rhoades loams, 2 to 6 percent slopes	5,850	0.4
Sn	Slickspots	925	0.1
SpC	Slimbutte-Arnegard-Reva complex, 2 to 12 percent slopes	825	*
SrE	Slimbutte-Reva complex, 6 to 60 percent slopes	17,835	1.0
SwA	Swanboy clay, 0 to 9 percent slopes	3,310	0.2
SyA	Swanboy-Slickspots complex, 0 to 2 percent slopes	6,765	0.4
TnB	Tanna silty clay loam, 2 to 9 percent slopes	5,520	0.3
ToA	Tanna-Gerdrum complex, 0 to 3 percent slopes	2,405	0.1
ToC	Tanna-Rhoades complex, 2 to 9 percent slopes	2,895	0.2
TrB	Trey loamy fine sand, 2 to 9 percent slopes	6,015	0.4
TtC	Trey-Fleak loamy fine sands, 2 to 15 percent slopes	17,535	1.0
TvB	Trey-Parchin-Bullock complex, 2 to 9 percent slopes	11,165	0.7
TwC	Twilight fine sandy loam, 6 to 9 percent slopes	31,650	1.8
TxE	Twilight-Blackhall fine sandy loams, 9 to 25 percent slopes	75,880	4.4
TyC	Twilight-Parchin fine sandy loams, 6 to 15 percent slopes	80,280	4.7
TzA	Twotop clay, 0 to 3 percent slopes	1,330	0.1
VaF	Vanocker-Reva complex, 6 to 60 percent slopes	12,340	0.7
VbB	Vebar fine sandy loam, 2 to 6 percent slopes	3,505	0.2
VcC	Vebar-Cohagen fine sandy loams, 6 to 9 percent slopes	15,660	0.9
VcD	Vebar-Cohagen fine sandy loams, 9 to 25 percent slopes	15,570	0.9
WaB	Watrous-Werner loams, 2 to 6 percent slopes	5,090	0.3
WbB	Watrous-Rhoades loams, 2 to 6 percent slopes	400	*
WdC	Werner-Reva complex, 3 to 9 percent slopes	555	*
WeC	Werner-Watrous loams, 2 to 9 percent slopes	4,535	0.3
WhB	Winler-Hisle complex, 0 to 9 percent slopes	1,210	0.1
WsC	Winler-Lismas clays, 2 to 15 percent slopes	13,420	0.8
ZaB	Zeona loamy fine sand, 2 to 9 percent slopes	19,595	1.1
ZaD	Zeona loamy fine sand, 9 to 25 percent slopes	5,515	0.3
ZbC	Zeona-Blownout land complex, 2 to 15 percent slopes	13,420	0.8
ZpB	Zeona-Parchin complex, 2 to 9 percent slopes	10,260	0.6
	Water	6,750	0.4
	Total	1,714,771	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Oats	Spring wheat	Winter wheat*	Alfalfa hay	Cool-season grass
	Bu	Bu	Bu	Tons	AUM**
AaA------------------------ Amor	49	27	32	1.7	2.7
AaB------------------------ Amor	46	25	30	1.5	2.4
AcC------------------------ Amor-Cabba	34	18	22	1.2	1.9
AdC------------------------ Amor-Rhoades	30	16	19	1.0	1.6
AeB------------------------ Amor-Werner	34	18	22	1.3	2.1
AkA------------------------ Archin-Bullock	23	12	15	0.4	0.6
Ar------------------------- Arnegard	55	23	36	2.0	3.2
AsA------------------------ Assinniboine	43	25	28	1.5	2.4
AsB------------------------ Assinniboine	40	21	25	1.3	2.1
AtA------------------------ Assinniboine-Archin	32	17	21	1.2	1.9
AwB------------------------ Attewan	32	17	21	1.0	1.6
Ba***. Badlands					
BeC------------------------ Boxwell	34	18	22	1.1	1.8
BkF. Bullock					
BnA. Bullock-Assinniboine					
BoD. Bullock-Cabbart					
BpB***. Bullock-Parchin-Slickspots					
BsA***. Bullock-Slickspots					
CaD. Cabba-Lantry-Amor					

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oats	Spring wheat	Winter wheat*	Alfalfa hay	Cool-season grass
	Bu	Bu	Bu	Tons	AUM**
CbD. Cabba-Reeder					
CcE. Cabbart					
CdE. Cabbart-Delridge					
CeE***. Cabbart-Rock outcrop					
ChA Chinook	38	20	24	1.3	2.1
CnA Chinook-Archin	30	16	19	0.9	1.4
CoE. Cohagen					
CrF***. Cohagen-Rock outcrop-Cabba Variant					
DcC. Delridge-Cabbart					
Du***. Dumps					
Dw***. Dune land					
EaA Eapa	46	25	30	1.5	2.4
EcA Eapa-Archin	34	18	22	1.2	1.9
FaB Farnuf	47	26	31	1.6	2.6
FtE***. Fleak-Trey-Rock outcrop					
GdA Gerdrum	26	13	16	0.6	1.0
Ge Glendive	40	21	25	1.5	2.4
GhB Glendive-Archin	25	13	16	0.6	1.0
GkA Grail	55	30	36	2.0	3.2
GrA Grail-Daglum	44	22	26	1.5	2.4

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oats	Spring wheat	Winter wheat*	Alfalfa hay	Cool-season grass
	Bu	Bu	Bu	Tons	AUM**
Ha----------------------- Hanly	22	11	---	---	---
Hb. Hanly					
Hd. Hanly-Dogiecreek					
He***. Hanly-Slickspots					
Hf. Harlem					
Hg----------------------- Havre	43	23	28	1.8	2.9
Hh----------------------- Havre-Harlem	43	23	28	1.8	2.9
Hk. Heil					
HsB***. Hisle-Slickspots					
KcF***. Kirby-Cabbart-Rock outcrop					
Ke----------------------- Korchea	54	29	35	1.9	3.0
Kg----------------------- Korchea	---	---	---	1.9	3.0
Km----------------------- Korchea-Archin	36	18	24	1.2	1.9
KoA---------------------- Kremlin	43	23	28	1.4	2.2
KrA---------------------- Kremlin-Archin	34	18	22	1.1	1.8
KyB---------------------- Kyle	36	18	24	1.2	1.9
Le. Lallie					
LhD. Lismas-Hisle					
LkD. Lismas-Winler					
LrF***. Lismas-Rock outcrop					

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oats	Spring wheat	Winter wheat*	Alfalfa hay	Cool-season grass
	Bu	Bu	Bu	Tons	AUM**
MaB------ Marmarth	41	22	27	1.3	2.1
McC------ Marmarth-Cabbart	28	15	18	1.0	1.6
MpB------ Marmarth-Parchin	30	16	19	0.9	1.4
MtC------ Marmarth-Twilight	30	16	19	1.2	1.9
MtD. Marmarth-Twilight					
NaD. Nihill Variant-Attewan					
PbB------ Parchin-Bullock	22	11	14	0.3	0.5
PhA------ Parshall	47	25	29	1.8	2.9
Pt***. Pits					
RbB------ Reeder	46	25	30	1.5	2.4
RcC. Reeder-Cabba					
ReB------ Reeder-Rhoades	34	18	22	1.2	1.9
RfE. Reva-Slimbutte					
RgE***. Reva-Rock outcrop					
RhB------ Rhame	30	16	19	1.2	1.9
RmB------ Rhame-Parchin	28	15	18	0.8	1.3
RnA, RnB. Rhoades-Daglum					
RoF***. Rock outcrop					
RrF***. Rock outcrop-Reva					
RsF. Rockoa-Reva					

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oats	Spring wheat	Winter wheat*	Alfalfa hay	Cool-season grass
	Bu	Bu	Bu	Tons	AUM**
SaA. Sage					
SbA. Sage-Hisle Variant					
SgA. Savage	50	27	33	1.7	2.7
ShB. Shambo	47	26	31	1.6	2.6
SmB. Shambo-Rhoades	35	19	23	1.2	1.9
Sn***. Slickspots					
SpC. Slimbutte-Arnegard-Reva					
SrE. Slimbutte-Reva					
SwA. Swanboy					
SyA***. Swanboy-Slickspots					
TnB. Tanna	37	20	24	1.3	2.1
ToA. Tanna-Gerdrum	30	16	19	1.2	1.9
ToC. Tanna-Rhoades	28	14	17	0.7	1.1
TrB. Trey					
TtC. Trey-Fleak					
TvB. Trey-Parchin-Bullock					
TwC. Twilight	30	16	19	1.0	1.6
TxE. Twilight-Blackhall					
TyC. Twilight-Parchin					
TzA. Twotop					

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oats	Spring wheat	Winter wheat*	Alfalfa hay	Cool-season grass
	Bu	Bu	Bu	Tons	AUM**
VaF. Vanocker-Reva					
VbB. Vebar	38	20	24	1.4	2.2
VcC. Vebar-Cohagen	28	14	17	1.0	1.6
VcD. Vebar-Cohagen					
WaB. Watrous-Werner	30	16	19	1.0	1.6
WbB. Watrous-Rhoades	28	15	18	0.7	1.1
WdC. Werner-Reva					
WeC. Werner-Watrous					
WhB. Winler-Hisle					
WsC. Winler-Lismas					
ZaB, ZaD. Zeona					
ZbC***. Zeona-Blownout land					
ZpB. Zeona-Parchin					

* Winter wheat is grown under a summer fallow system of management. The yields can be expected only in alternate years.

** Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

*** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--RANGELAND PRODUCTIVITY

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
AaA, AaB: Amor	Silty	2,400	2,000	1,400
AcC*:				
Amor	Silty	2,400	2,000	1,400
Cabba	Shallow	1,700	1,400	1,000
AdC*:				
Amor	Silty	2,400	2,000	1,400
Rhoades	Thin Claypan	1,000	800	500
AeB*:				
Amor	Silty	2,400	2,000	1,400
Werner	Shallow	1,800	1,500	1,100
AkA*:				
Archin	Claypan	1,600	1,300	900
Bullock	Thin Claypan	1,000	800	500
Ar: Arnegard	Loamy Overflow	3,800	3,200	2,200
AsA, AsB: Assinniboine	Sandy	2,400	2,000	1,400
AtA*:				
Assinniboine	Sandy	2,400	2,000	1,400
Archin	Claypan	1,600	1,300	900
AwB: Attewan	Silty	2,200	1,700	1,250
BeC: Boxwell	Silty	1,900	1,700	1,100
BkF: Bullock	Thin Claypan	900	700	400
BnA*:				
Bullock	Thin Claypan	1,000	800	500
Assinniboine	Sandy	2,500	2,000	1,500
BoD*:				
Bullock	Thin Claypan	900	700	400
Cabbart	Shallow	1,700	1,300	1,000
BpB*:				
Bullock	Thin Claypan	900	700	400
Parchin	Claypan	1,600	1,300	900

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
BpB*:				
Slickspots.				
BsA*:				
Bullock	Thin Claypan	900	700	400
Slickspots.				
CaD*:				
Cabba	Shallow	1,700	1,400	1,000
Lantry	Thin Upland	1,800	1,500	1,100
Amor	Silty	2,300	1,900	1,300
CbD*:				
Cabba	Shallow	1,900	1,400	1,200
Reeder	Silty	2,300	1,900	1,700
CcE Cabbart	Shallow	1,400	1,200	800
CdE*:				
Cabbart	Shallow	1,600	1,300	900
Delridge	Thin Upland	1,600	1,300	900
CeE*:				
Cabbart	Shallow	1,600	1,300	900
Rock outcrop.				
ChA Chinook	Sandy	2,300	1,900	1,300
CnA*:				
Chinook	Sandy	2,300	1,900	1,300
Archin	Claypan	1,600	1,300	900
CoE Cohagen	Shallow	1,600	1,300	900
CrF*:				
Cohagen	Shallow	1,600	1,300	900
Rock outcrop.				
Cabba Variant	Shallow	1,600	1,300	900
DcC*:				
Delridge	Thin Upland	1,700	1,400	1,000
Cabbart	Shallow	1,600	1,300	900
EaA Eapa	Silty	2,300	1,900	1,300
EcA*:				
Eapa	Silty	2,300	1,900	1,300
Archin	Claypan	1,700	1,300	1,000

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
FaB---------------------- Farnuf	Silty----------------------------------	2,400	2,000	1,400
FtE*:				
Fleak------------------	Shallow--------------------------------	1,300	1,100	800
Trey-------------------	Sands----------------------------------	2,400	2,000	1,400
Rock outcrop.				
GdA---------------------- Gerdrum	Claypan--------------------------------	1,700	1,400	1,000
Ge----------------------- Glendive	Loamy Terrace--------------------------	2,800	2,300	1,600
GhB*:				
Glendive---------------	Sandy----------------------------------	2,300	1,900	1,300
Archin-----------------	Claypan--------------------------------	1,600	1,300	900
GkA---------------------- Grail	Loamy Overflow-------------------------	3,800	3,200	2,200
GrA*:				
Grail------------------	Loamy Overflow-------------------------	3,800	3,200	2,000
Daglum-----------------	Claypan--------------------------------	1,700	1,400	1,000
Ha----------------------- Hanly	Sandy----------------------------------	2,300	1,900	1,300
Hb----------------------- Hanly	Sands----------------------------------	2,400	2,000	1,400
Hd*:				
Hanly------------------	Sands----------------------------------	2,400	2,000	1,400
Dogiecreek-------------	Saline Lowland-------------------------	1,300	1,200	1,000
He*:				
Hanly------------------	Sands----------------------------------	2,400	2,000	1,400
Slickspots.				
Hf----------------------- Harlem	Clayey Overflow------------------------	2,900	2,400	1,700
Hg----------------------- Havre	Loamy Terrace--------------------------	2,800	2,300	1,600
Hh*:				
Havre------------------	Loamy Terrace--------------------------	2,800	2,300	1,600
Harlem-----------------	Clayey Overflow------------------------	2,900	2,400	1,700
Hk----------------------- Heil	Closed Depression----------------------	2,400	2,200	1,500
HsB*:				
Hisle------------------	Thin Claypan---------------------------	900	700	400

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
HsB*:				
Slickspots.				
KcF*:				
Kirby	Very Shallow	1,000	800	500
Cabbart	Shallow	1,400	1,200	800
Rock outcrop.				
Ke, Kg Korchea	Loamy Overflow	3,500	2,900	2,000
Km*:				
Korchea	Loamy Overflow	3,500	2,900	2,000
Archin	Claypan	1,700	1,400	1,000
KoA Kremlin	Silty	2,300	1,900	1,300
KrA*:				
Kremlin	Silty	2,300	1,900	1,300
Archin	Claypan	1,600	1,300	900
KyB Kyle	Clayey	1,800	1,500	1,000
Le Lallie	Clayey Overflow	2,900	2,400	1,700
LhD*:				
Lismas	Shallow Dense Clay	1,200	900	600
Hisle	Thin Claypan	900	700	400
LkD*:				
Lismas	Shallow Dense Clay	1,200	900	600
Winler	Dense Clay	1,400	1,100	700
LrF*:				
Lismas	Shallow Dense Clay	1,000	800	500
Rock outcrop.				
MaB Marmarth	Silty	2,200	1,800	1,300
McC*:				
Marmarth	Silty	2,200	1,800	1,300
Cabbart	Shallow	1,700	1,400	1,000
MpB*:				
Marmarth	Silty	2,200	1,800	1,300
Parchin	Claypan	1,600	1,300	900

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
MtC*, MtD*:				
Marmarth	Silty	2,000	1,700	1,200
Twilight	Sandy	2,200	1,800	1,300
NaD*:				
Nihill Variant	Thin Upland	1,200	1,000	700
Attewan	Silty	1,900	1,600	1,100
PbB*:				
Parchin	Claypan	1,500	1,300	900
Bullock	Thin Claypan	1,000	800	500
PhA Parshall	Sandy	2,800	2,300	1,600
RbB Reeder	Silty	2,300	2,000	1,700
RcC*:				
Reeder	Silty	2,300	2,000	1,700
Cabba	Shallow	1,700	1,400	1,000
ReB*:				
Reeder	Silty	2,300	2,000	1,700
Rhoades	Thin Claypan	1,000	800	500
RfE*:				
Reva	Shallow	1,400	1,200	800
Slimbutte	Stony Hills	2,400	2,000	1,400
RgE*:				
Reva	Shallow	1,400	1,200	800
Rock outcrop.				
RhB Rhame	Sandy	2,200	1,800	1,300
RmB*:				
Rhame	Sandy	2,200	1,800	1,300
Parchin	Claypan	1,600	1,300	900
RnA*, RnB*:				
Rhoades	Thin Claypan	1,000	800	500
Daglum	Claypan	1,700	1,400	1,000
RrF*:				
Rock outcrop.				
Reva	Shallow	1,400	1,200	800
RsF*:				
Rockoa.				
Reva	Shallow	1,400	1,200	800

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
SaA-----Sage	Saline Lowland	1,300	1,200	1,000
SbA*:				
Sage	Saline Lowland	1,300	1,200	1,000
Hisle Variant	Saline Lowland	1,300	1,200	1,000
SgA-----Savage	Clayey	2,400	2,000	1,400
ShB-----Shambo	Silty	2,400	2,000	1,400
SmB*:				
Shambo	Silty	2,400	2,000	1,400
Rhoades	Thin Claypan	1,000	800	500
SpC*:				
Slimbutte	Stony Hills	2,600	2,200	1,500
Arnegard	Silty	2,600	2,200	1,500
Reva	Shallow	1,800	1,500	1,000
SrE*:				
Slimbutte	Stony Hills	2,400	2,000	1,400
Reva	Shallow	1,400	1,200	800
SwA-----Swanboy	Dense Clay	1,300	1,000	600
SyA*:				
Swanboy	Dense Clay	1,300	1,000	600
Slickspots.				
TnB-----Tanna	Clayey	2,000	1,700	1,200
ToA*:				
Tanna	Clayey	2,000	1,700	1,200
Gerdrum	Claypan	1,700	1,400	1,000
ToC*:				
Tanna	Clayey	2,000	1,700	1,200
Rhoades	Thin Claypan	1,000	800	500
TrB-----Trey	Sands	2,400	2,000	1,400
TtC*:				
Trey	Sands	2,400	2,000	1,400
Fleak	Shallow	1,400	1,200	800
TvB*:				
Trey	Sands	2,400	2,000	1,400

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
TvB*:				
Parchin	Sandy	2,000	1,700	1,200
Bullock	Thin Claypan	1,000	800	500
TwC Twilight	Sandy	2,300	1,900	1,300
TxE*:				
Twilight	Sandy	2,200	1,800	1,300
Blackhall	Shallow	1,600	1,300	900
TyC*:				
Twilight	Sandy	2,300	1,900	1,300
Parchin	Sandy	2,000	1,700	1,200
TzA Twotop	Dense Clay	1,600	1,200	700
VaF*: Vanocker.				
Reva	Shallow	1,400	1,200	800
VbB Vebar	Sandy	2,500	2,100	1,500
VcC*, VcD*:				
Vebar	Sandy	2,400	2,000	1,400
Cohagen	Shallow	1,700	1,400	1,000
WaB*:				
Watrous	Silty	2,300	1,900	1,300
Werner	Shallow	1,700	1,500	1,100
WbB*:				
Watrous	Silty	2,300	1,900	1,300
Rhoades	Thin Claypan	1,000	800	500
WdC*:				
Werner	Shallow	1,700	1,400	1,000
Reva	Shallow	1,800	1,500	1,100
WeC*:				
Werner	Shallow	1,700	1,400	1,000
Watrous	Silty	2,300	1,900	1,300
WhB*:				
Winler	Dense Clay	1,400	1,100	700
Hisle	Thin Claypan	900	700	400
WsC*:				
Winler	Dense Clay	1,400	1,100	700
Lismas	Shallow Dense Clay	1,200	900	600

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
ZaB----------------------- Zeona	Sands------------------------------------	2,400	2,000	1,400
ZaD----------------------- Zeona	Sands------------------------------------	2,300	1,900	1,300
ZbC*:				
Zeona---------------------	Sands------------------------------------	2,400	2,000	1,400
Blownout land.				
ZpB*:				
Zeona---------------------	Sands------------------------------------	2,400	2,000	1,400
Parchin-------------------	Sandy------------------------------------	2,000	1,700	1,200

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
RsF**:										
Rockoa	3R	Moderate	Severe	Moderate	Slight	Slight	Ponderosa pine	60	46	Ponderosa pine.
Reva.										
VaF**:										
Vanocker	3R	Severe	Severe	Moderate	Slight	Slight	Ponderosa pine	62	48	Ponderosa pine.
Reva.										

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
AaA, AaB: Amor	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
AcC*:				
Amor	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Cabba.				
AdC*:				
Amor	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Rhoades.				
AeB*:				
Amor	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Werner.				
AkA*:				
Archin	Green ash, Russian-olive, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, eastern redcedar, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
Bullock.				
Ar: Arnegard	Tatarian honeysuckle, American plum, Peking cotoneaster.	Manchurian crabapple, common chokecherry, eastern redcedar, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
AsA, AsB: Assinniboine	American plum, silver buffaloberry.	Rocky Mountain juniper, Manchurian crabapple, Tatarian honeysuckle, lilac, Siberian peashrub, common chokecherry.	Green ash, ponderosa pine, Russian-olive, Siberian elm.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35
AtA*:				
Assinniboine-----	American plum, silver buffaloberry.	Rocky Mountain juniper, Manchurian crabapple, Tatarian honeysuckle, lilac, Siberian peashrub, common chokecherry.	Green ash, ponderosa pine, Russian-olive, Siberian elm.	---
Archin-----------	Green ash, Russian-olive, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, eastern redcedar, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
AwB--------------- Attewan	Siberian peashrub-----	Ponderosa pine, Russian-olive, hackberry, green ash, Rocky Mountain juniper, eastern redcedar.	Siberian elm----------	---
Ba*. Badlands				
BeC--------------- Boxwell	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
BkF. Bullock				
BnA*:				
Bullock.				
Assinniboine-----	American plum, silver buffaloberry.	Rocky Mountain juniper, Manchurian crabapple, Tatarian honeysuckle, lilac, Siberian peashrub, common chokecherry.	Green ash, ponderosa pine, Russian-olive, Siberian elm.	---
BoD*:				
Bullock.				
Cabbart.				
BpB*:				
Bullock.				
Parchin----------	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35
BpB*: Slickspots.				
BsA*: Bullock.				
Slickspots.				
CaD*: Cabba.				
Lantry.				
Amor	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
CbD*: Cabba.				
Reeder	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	
CcE. Cabbart.				
CdE*: Cabbart.				
Delridge.				
CeE*: Cabbart.				
Rock outcrop.				
ChA Chinook	American plum, silver buffaloberry.	Rocky Mountain juniper, Manchurian crabapple, Tatarian honeysuckle, lilac, Siberian peashrub, common chokecherry.	Green ash, ponderosa pine, Russian-olive, Siberian elm.	---
CnA*: Chinook	American plum, silver buffaloberry.	Rocky Mountain juniper, Manchurian crabapple, Tatarian honeysuckle, lilac, Siberian peashrub, common chokecherry.	Green ash, ponderosa pine, Russian-olive, Siberian elm.	---
Archin	Green ash, Russian-olive, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, eastern redcedar, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35
CoE. Cohagen				
CrF*: Cohagen.				
Rock outcrop.				
Cabba Variant.				
DcC*: Delridge.				
Cabbart.				
Du*. Dumps				
Dw*. Dune land				
EaA Eapa	---	Manchurian crabapple, Black Hills spruce, eastern redcedar, Russian-olive, Tatarian honeysuckle, Siberian peashrub, American plum, common chokecherry, lilac.	Siberian elm, green ash, ponderosa pine.	---
EcA*: Eapa	---	Manchurian crabapple, Black Hills spruce, eastern redcedar, Russian-olive, Tatarian honeysuckle, Siberian peashrub, American plum, common chokecherry, lilac.	Siberian elm, green ash, ponderosa pine.	---
Archin	Green ash, Russian-olive, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, eastern redcedar, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
FaB Farnuf	---	Manchurian crabapple, Russian-olive, eastern redcedar, Tatarian honeysuckle, common chokecherry, lilac, American plum, Siberian peashrub, Black Hills spruce.	Green ash, ponderosa pine, Siberian elm.	---
FtE*: Fleak.				
Trey.				
Rock outcrop.				

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35
GdA: Gerdrum	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Tatarian honeysuckle, lilac, silver buffaloberry, Siberian peashrub.	Siberian elm, ponderosa pine.	---	---
Ge: Glendive	---	Manchurian crabapple, Russian-olive, eastern redcedar, Tatarian honeysuckle, Siberian peashrub, lilac, American plum, common chokecherry.	Golden willow, green ash, ponderosa pine, blue spruce.	Plains cottonwood.
GhB*:				
Glendive	American plum, silver buffaloberry.	Rocky Mountain juniper, Manchurian crabapple, Tatarian honeysuckle, Siberian peashrub, lilac, common chokecherry.	Green ash, Siberian elm, ponderosa pine, Russian-olive.	---
Archin	Green ash, Russian-olive, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, eastern redcedar, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
GkA: Grail	American plum, Peking cotoneaster, Tatarian honeysuckle.	Manchurian crabapple, eastern redcedar, common chokecherry, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
GrA*:				
Grail	American plum, Peking cotoneaster, Tatarian honeysuckle.	Manchurian crabapple, eastern redcedar, common chokecherry, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
Daglum	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
Ha, Hb: Hanly	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
Hd*:				
Hanly	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---
Dogiecreek.				
He*:				
Hanly	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---
Slickspots.				
Hf Harlem	Tatarian honeysuckle, American plum, Peking cotoneaster.	Manchurian crabapple, eastern redcedar, common chokecherry, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
Hg Havre	Tatarian honeysuckle, American plum, Peking cotoneaster.	Eastern redcedar, common chokecherry, Manchurian crabapple, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
Hh*:				
Havre	Tatarian honeysuckle, American plum, Peking cotoneaster.	Eastern redcedar, common chokecherry, Manchurian crabapple, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
Harlem	Tatarian honeysuckle, American plum, Peking cotoneaster.	Manchurian crabapple, common chokecherry, eastern redcedar, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
Hk. Heil				
HsB*:				
Hisle.				
Slickspots.				
KcF*:				
Kirby.				
Cabbart.				
Rock outcrop.				
Ke Korchea	Peking cotoneaster, Tatarian honeysuckle, American plum.	Manchurian crabapple, green ash, common chokecherry, eastern redcedar, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35
Kg: Korchea	American plum, Tatarian honeysuckle, Peking cotoneaster.	Siberian peashrub, eastern redcedar, common chokecherry, Manchurian crabapple.	Ponderosa pine, golden willow, green ash, blue spruce.	Plains cottonwood.
Km*:				
Korchea	Peking cotoneaster, Tatarian honeysuckle, American plum.	Manchurian crabapple, common chokecherry, eastern redcedar, Siberian peashrub.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
Archin	Green ash, Russian-olive, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, eastern redcedar, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
KoA: Kremlin	---	Russian-olive, Siberian peashrub, lilac, common chokecherry, Tatarian honeysuckle, eastern redcedar, Black Hills spruce, Manchurian crabapple, American plum.	Ponderosa pine, green ash, Siberian elm.	---
KrA*:				
Kremlin	---	Manchurian crabapple, Black Hills spruce, Russian-olive, Siberian peashrub, lilac, common chokecherry, Tatarian honeysuckle, eastern redcedar, American plum.	Russian-olive, ponderosa pine, green ash, Siberian elm.	---
Archin	Green ash, Russian-olive, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, eastern redcedar, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
KyB: Kyle	Siberian peashrub, American plum, Tatarian honeysuckle, lilac, golden currant.	Ponderosa pine, green ash, Rocky Mountain juniper, Russian-olive, eastern redcedar, common chokecherry.	Siberian elm, honeylocust.	---
Le. Lallie				
LhD*:				
Lismas.				
Hisle.				

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
LkD*: Lismas.				
Winler.				
LrF*: Lismas.				
Rock outcrop.				
MaB: Marmarth	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
McC*: Marmarth	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Cabbart.				
MpB*: Marmarth	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Parchin	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
MtC*, MtD*: Marmarth	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Twilight	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35
NaD*:				
Nihill Variant.				
Attewan	Siberian peashrub	Ponderosa pine, Russian-olive, hackberry, green ash, Rocky Mountain juniper, eastern redcedar.	Siberian elm	---
PbB*:				
Parchin	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
Bullock.				
PhA Parshall	American plum, silver buffaloberry.	Russian-olive, Manchurian crabapple, common chokecherry, Siberian peashrub, Rocky Mountain juniper, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine, green ash.	---
Pt*. Pits				
RbB Reeder	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
RcC*:				
Reeder	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Cabba.				
ReB*:				
Reeder	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Rhoades.				

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
RfE*: Reva.				
Slimbutte.				
RgE*: Reva.				
Rock outcrop.				
RhB-----Rhame	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
RmB*: Rhame-----	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Parchin-----	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
RnA*, RnB*: Rhoades.				
Daglum-----	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
RoF*. Rock outcrop				
RrF*: Rock outcrop.				
Reva.				
RsF*: Rockoa.				
Reva.				

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
SaA. Sage				
SbA*: Sage.				
Hisle Variant.				
SgA: Savage	---	Manchurian crabapple, lilac, Russian-olive, Siberian peashrub, common chokecherry, eastern redcedar, Tatarian honeysuckle, Black Hills spruce, American plum.	Siberian elm, green ash, ponderosa pine.	---
ShB: Shambo	---	Black Hills spruce, eastern redcedar, Russian-olive, Siberian peashrub, common chokecherry, lilac, Tatarian honeysuckle, American plum, Manchurian crabapple.	Siberian elm, green ash, ponderosa pine.	---
SmB*: Shambo	---	Eastern redcedar, Russian-olive, Siberian peashrub, common chokecherry, lilac, Tatarian honeysuckle, American plum, Manchurian crabapple.	Siberian elm, green ash, ponderosa pine.	---
Rhoades.				
Sn*. Slickspots				
SpC*: Slimbutte.				
Arnegard	Peking cotoneaster, Tatarian honeysuckle, American plum.	Common chokecherry, eastern redcedar, Siberian peashrub, Manchurian crabapple.	Golden willow, ponderosa pine, green ash, blue spruce.	Plains cottonwood.
Reva.				
SrE*: Slimbutte.				
Reva.				
SwA. Swanboy				

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
SyA*: Swanboy.				
Slickspots.				
TnB Tanna	Tatarian honeysuckle, lilac, American plum, silver buffaloberry, Siberian peashrub.	Russian-olive, eastern redcedar, Rocky Mountain juniper, common chokecherry.	Siberian elm	---
ToA*: Tanna	Tatarian honeysuckle, lilac, American plum, silver buffaloberry, Siberian peashrub.	Russian-olive, eastern redcedar, Rocky Mountain juniper, common chokecherry.	Siberian elm, green ash, ponderosa pine.	---
Gerdrum	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Tatarian honeysuckle, lilac, silver buffaloberry, Siberian peashrub.	Siberian elm, ponderosa pine.	---	---
ToC*: Tanna	Tatarian honeysuckle, lilac, American plum, silver buffaloberry, Siberian peashrub.	Russian-olive, eastern redcedar, Rocky Mountain juniper, common chokecherry.	Siberian elm, green ash, ponderosa pine.	---
Rhoades.				
TrB Trey	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---
TtC*: Trey	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---
Fleak.				
TvB*: Trey	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---
Parchin	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35
TvB*: Bullock.				
TwC: Twilight	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
TxE*: Twilight	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Blackhall.				
TyC*: Twilight	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
Parchin	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---
TzA. Twotop				
VaF*: Vanocker.				
Reva.				
VbB: Vebar	Tatarian honeysuckle, lilac, silver buffaloberry.	Bur oak, Siberian peashrub, eastern redcedar, common chokecherry, American plum, Siberian crabapple.	Russian-olive, green ash, ponderosa pine.	---
VcC*: Vebar	Tatarian honeysuckle, lilac, silver buffaloberry.	Bur oak, Siberian peashrub, eastern redcedar, common chokecherry, American plum, Siberian crabapple.	Russian-olive, green ash, ponderosa pine.	---
Cohagen.				

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
VcD*:				
Vebar.				
Cohagen.				
WaB*:				
Watrous	---	American plum, Black Hills spruce, Russian-olive, Siberian peashrub, common chokecherry, eastern redcedar, lilac, Tatarian honeysuckle.	Bur oak, green ash, ponderosa pine, Siberian crabapple.	---
Werner.				
WbB*:				
Watrous	---	American plum, Black Hills spruce, Russian-olive, Siberian peashrub, common chokecherry, eastern redcedar, lilac, Tatarian honeysuckle.	Bur oak, green ash, ponderosa pine, Siberian crabapple.	---
Rhoades.				
WdC*:				
Werner.				
Reva.				
WeC*:				
Werner.				
Watrous	Lilac, Peking cotoneaster.	Rocky Mountain juniper, ponderosa pine, Siberian peashrub, Russian-olive, eastern redcedar.	Green ash, Siberian elm.	---
WhB*:				
Winler.				
Hisle.				
WsC*:				
Winler.				
Lismas.				
ZaB, ZaD: Zeona	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	<8	8-15	16-25	26-35
ZbC*:				
Zeona	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---
Blownout land.				
ZpB*:				
Zeona	---	Ponderosa pine, eastern redcedar, Rocky Mountain juniper.	---	---
Parchin	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle, lilac.	Siberian elm, ponderosa pine.	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
AaA, AaB Amor	Good	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
AcC*:									
Amor	Fair	Good	Good	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Cabba	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
AdC*:									
Amor	Fair	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Rhoades	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Poor.
AeB*:									
Amor	Good	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Werner	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair	Poor	Very poor.	Very poor.
AkA*:									
Archin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Bullock	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Ar Arnegard	Good	Good	Fair	Good	Very poor.	Very poor.	Fair	Very poor.	Very poor.
AsA, AsB Assinniboine	Fair	Fair	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
AtA*:									
Assinniboine	Fair	Fair	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Archin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
AwB Attewan	Poor	Fair	Good	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Ba*. Badlands									
BeC Boxwell	Poor	Good	Good	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
BkF Bullock	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
BnA*:									
Bullock	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Assinniboine	Fair	Fair	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
BoD*:									
Bullock	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Cabbart	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.
BpB*:									
Bullock	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.
Parchin	Poor	Poor	Poor	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.
Slickspots.									
BsA*:									
Bullock	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.
Slickspots.									
CaD*:									
Cabba	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Lantry	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Amor	Very poor.	Good	Good	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
CbD*:									
Cabba	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Reeder	Very poor.	Good	Good	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
CcE Cabbart	Very poor.	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.
CdE*:									
Cabbart	Very poor.	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Delridge	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
CeE*:									
Cabbart	Very poor.	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
CeE*: Rock outcrop.									
ChA: Chinook	Fair	Fair	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
CnA*: Chinook	Fair	Fair	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Archin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
CoE: Cohagen	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
CrF*: Cohagen	Very poor.	Very poor.	Fair	Poor	Fair	Fair	Fair	Very poor.	Very poor.
Rock outcrop.									
Cabba Variant	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
DcC*: Delridge	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Cabbart	Very poor.	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Du*. Dumps									
Dw*. Dune land									
EaA: Eapa	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Very poor.	Very poor.
EcA*: Eapa	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Archin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
FaB: Farnuf	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Very poor.	Very poor.
FtE*: Fleak	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Trey	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rock outcrop.									

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
GdA----------------- Gerdrum	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Ge------------------ Glendive	Fair	Fair	Good	Good	Good	Fair	Good	Very poor.	Very poor.
GhB*:									
Glendive----------	Poor	Fair	Good	Good	Good	Very poor.	Fair	Very poor.	Very poor.
Archin------------	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
GkA----------------- Grail	Good	Good	Fair	Good	Very poor.	Very poor.	Fair	Very poor.	Very poor.
GrA*:									
Grail-------------	Good	Good	Fair	Good	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Daglum------------	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Ha------------------ Hanly	Very poor.	Fair	Good	Poor	Poor	Very poor.	Fair	Very poor.	Very poor.
Hb------------------ Hanly	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Fair	Very poor.	Very poor.
Hd*:									
Hanly-------------	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Dogiecreek--------	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Poor	Poor.
He*:									
Hanly-------------	Very poor.	Very poor.	Fair	Poor	Poor	Very poor.	Fair	Very poor.	Very poor.
Slickspots.									
Hf------------------ Harlem	Poor	Good	Fair	Good	Poor	Very poor.	Good	Very poor.	Very poor.
Hg------------------ Havre	Fair	Good	Good	Good	Good	Very poor.	Good	Very poor.	Very poor.
Hh*:									
Havre-------------	Fair	Good	Good	Good	Good	Very poor.	Good	Very poor.	Very poor.
Harlem------------	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Very poor.
Hk------------------ Heil	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Fair.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
HsB*:									
Hisle	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Slickspots.									
KcF*:									
Kirby	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Cabbart	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.
Rock outcrop.									
Ke Korchea	Good	Good	Fair	Good	Good	Very poor.	Good	Very poor.	Very poor.
Kg Korchea	Very poor.	Good	Fair	Good	Good	Very poor.	Good	Very poor.	Very poor.
Km*:									
Korchea	Good	Good	Fair	Good	Good	Very poor.	Good	Very poor.	Very poor.
Archin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
KoA Kremlin	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Very poor.	Very poor.
KrA*:									
Kremlin	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Archin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
KyB Kyle	Poor	Fair	Good	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Le Lallie	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Fair	Fair.
LhD*:									
Lismas	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Hisle	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
LkD*:									
Lismas	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Winler	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
LrF*:									
Lismas	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rock outcrop.									
MaB Marmarth	Fair	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
McC*:									
Marmarth	Fair	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Cabbart	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.
MpB*:									
Marmarth	Fair	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Parchin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
MtC*:									
Marmarth	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Twilight	Poor	Fair	Good	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
MtD*:									
Marmarth	Very poor.	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Twilight	Very poor.	Fair	Good	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
NaD*:									
Nihill Variant	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Attewan	Very poor.	Fair	Good	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
PbB*:									
Parchin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Bullock	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
PhA Parshall	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Pt*. Pits									
RbB Reeder	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Very poor.	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
RcC*:									
Reeder	Fair	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Cabba	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
ReB*:									
Reeder	Good	Good	Good	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Rhoades	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
RfE*:									
Reva	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.
Slimbutte	Very poor.	Very poor.	Fair	Poor	Fair	Good	Good	Very poor.	Very poor.
RgE*:									
Reva	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.
Rock outcrop.									
RhB Rhame	Poor	Fair	Good	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.
RmB*:									
Rhame	Poor	Fair	Good	Fair	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Parchin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
RnA*, RnB*:									
Rhoades	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Daglum	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
RoF*. Rock outcrop									
RrF*:									
Rock outcrop.									
Reva	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.
RsF*:									
Rockoa	Very poor.	Very poor.	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.
Reva	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
SaA: Sage	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
SbA*:									
Sage	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Hisle Variant	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
SgA: Savage	Good	Good	Good	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
ShB: Shambo	Good	Good	Good	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
SmB*:									
Shambo	Good	Good	Good	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rhoades	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Sn*. Slickspots									
SpC*:									
Slimbutte	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.
Arnegard	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Reva	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.
SrE*:									
Slimbutte	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.
Reva	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.
SwA: Swanboy	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
SyA*:									
Swanboy	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Slickspots.									
TnB: Tanna	Poor	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
ToA*:									
Tanna	Fair	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
ToA*:									
Gerdrum	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
ToC*:									
Tanna	Poor	Fair	Good	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rhoades	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
TrB: Trey	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
TtC*:									
Trey	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Fleak	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
TvB*:									
Trey	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Parchin	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
Bullock	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
TwC: Twilight	Poor	Fair	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
TxE*:									
Twilight	Very poor.	Very poor.	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Blackhall	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
TyC*:									
Twilight	Very poor.	Very poor.	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Parchin	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.
TzA: Twotop	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
VaF*:									
Vanocker	Very poor.	Very poor.	Poor	Poor	Good	Good	Good	Very poor.	Very poor.
Reva	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Fair	Very poor.
VbB: Vebar	Fair	Fair	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
VcC*:									
Vebar	Poor	Fair	Good	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Cohagen	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
VcD*:									
Vebar	Very poor.	Very poor.	Good	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Cohagen	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
WaB*:									
Watrous	Good	Good	Good	Fair	Very poor.	Fair	Fair	Very poor.	Very poor.
Werner	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair	Poor	Very poor.	Very poor.
WbB*:									
Watrous	Good	Good	Good	Fair	Very poor.	Fair	Fair	Very poor.	Very poor.
Rhoades	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
WdC*:									
Werner	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair	Poor	Very poor.	Very poor.
Reva	Very poor.	Very poor.	Fair	Poor	Fair	Good	Fair	Very poor.	Very poor.
WeC*:									
Werner	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair	Poor	Very poor.	Very poor.
Watrous	Good	Good	Good	Fair	Very poor.	Fair	Fair	Very poor.	Very poor.
WhB*:									
Winler	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Hisle	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.
WsC*:									
Winler	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Lismas	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
ZaB, ZaD Zeona	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Planted trees and shrubs	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
ZbC*:									
Zeona	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Blownout land.									
ZpB*:									
Zeona	Very poor.	Very poor.	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Parchin	Very poor.	Poor	Fair	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
AaA: Amor	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
AaB: Amor	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
AcC*:					
Amor	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Cabba	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
AdC*:					
Amor	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Rhoades	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
AeB*:					
Amor	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Werner	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.
AkA*:					
Archin	Slight	Slight	Slight	Slight	Moderate: low strength.
Bullock	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
Ar: Arnegard	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
AsA: Assinniboine	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.
AsB: Assinniboine	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.
AtA*:					
Assinniboine	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
AtA*:					
Archin	Slight	Slight	Slight	Slight	Moderate: low strength.
AwB Attewan	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Ba*. Badlands					
BeC Boxwell	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
BkF Bullock	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones.	Severe: large stones.	Severe: large stones.
BnA*:					
Bullock	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
Assinniboine	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.
BoD*:					
Bullock	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.
Cabbart	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BpB*:					
Bullock	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.
Parchin	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
Slickspots.					
BsA*:					
Bullock	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
Slickspots.					
CaD*:					
Cabba	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lantry	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Amor	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
CbD*:					
Cabba	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Reeder	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
CcE Cabbart	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CdE*:					
Cabbart	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Delridge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
CeE*:					
Cabbart	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
ChA Chinook	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
CnA*:					
Chinook	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Archin	Slight	Slight	Slight	Slight	Moderate: low strength.
CoE Cohagen	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CrF*:					
Cohagen	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
Cabba Variant	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, low strength, slope.
DcC*:					
Delridge	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Cabbart	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.
Du*. Dumps					

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Dw*. Dune land					
EaA: Eapa	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
EcA*:					
Eapa	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Archin	Slight	Slight	Slight	Slight	Moderate: low strength.
FaB: Farnuf	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
FtE*:					
Fleak	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Trey	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
GdA: Gerdrum	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Ge: Glendive	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.
GhB*:					
Glendive	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.
Archin	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.
GkA: Grail	Moderate: too clayey, wetness, flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.
GrA*:					
Grail	Moderate: too clayey, wetness, flooding.	Severe: flooding, shrink-swell.	Severe: flooding.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.
Daglum	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Ha, Hb: Hanly	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Hd*:					
Hanly	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Dogiecreek	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
He*:					
Hanly	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Slickspots.					
Hf Harlem	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.
Hg Havre	Moderate: too clayey.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, shrink-swell.
Hh*:					
Havre	Moderate: too clayey.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, shrink-swell.
Harlem	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.
Hk Heil	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.
HsB*:					
Hisle	Moderate: too clayey.	Severe: shrink-swell.	Slight	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Slickspots.					
KcF*:					
Kirby	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cabbart	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
Ke Korchea	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.
Kg Korchea	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Km*:					
Korchea----------	Slight----------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.
Archin----------	Slight----------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.
KoA-------------- Kremlin	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.
KrA*:					
Kremlin----------	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.
Archin----------	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength.
KyB-------------- Kyle	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Le--------------- Lallie	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.
LhD*:					
Lismas----------	Severe: slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Hisle-----------	Moderate: too clayey.	Severe: shrink-swell.	Slight----------	Severe: shrink-swell.	Severe: low strength, shrink-swell.
LkD*:					
Lismas----------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Winler----------	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
LrF*:					
Lismas----------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Rock outcrop.					
MaB-------------- Marmarth	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
McC*:					
Marmarth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.
Cabbart	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
MpB*:					
Marmarth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.
Parchin	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
MtC*:					
Marmarth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.
Twilight	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
MtD*:					
Marmarth	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.
Twilight	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
NaD*:					
Nihill Variant	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Attewan	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
PbB*:					
Parchin	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
Bullock	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.
PhA Parshall	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.
Pt*. Pits					
RbB Reeder	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
RcC*:					
Reeder	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Cabba	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
ReB*:					
Reeder	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Rhoades	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
RfE*:					
Reva	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Slimbutte	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RgE*:					
Reva	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					
RhB Rhame	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
RmB*:					
Rhame	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
Parchin	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
RnA*, RnB*:					
Rhoades	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Daglum	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
RoF*. Rock outcrop					
RrF*:					
Rock outcrop.					
Reva	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
RsF*:					
Rockoa	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Reva	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
SaA Sage	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
SbA*:					
Sage	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Hisle Variant	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, shrink-swell.
SgA Savage	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
ShB Shambo	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
SmB*:					
Shambo	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Rhoades	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Sn*. Slickspots					
SpC*:					
Slimbutte	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, frost action, large stones.
Arnegard	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.
Reva	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
SrE*:					
Slimbutte	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
SrE*:					
Reva	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
SwA Swanboy	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
SyA*:					
Swanboy	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Slickspots.					
TnB Tanna	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
ToA*:					
Tanna	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Gerdrum	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
ToC*:					
Tanna	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Rhoades	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
TrB Trey	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
TtC*:					
Trey	Severe: cutbanks cave.	Moderate: slope.	Slight	Severe: slope.	Moderate: slope.
Fleak	Slight	Moderate: slope.	Slight	Severe: slope.	Moderate: slope.
TvB*:					
Trey	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Parchin	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
Bullock	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.
TwC Twilight	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
TxE*:					
Twilight----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Blackhall---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
TyC*:					
Twilight----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Parchin-----------	Slight-----------	Slight-----------	Slight-----------	Moderate: slope.	Moderate: low strength.
TzA--------------- Twotop	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
VaF*:					
Vanocker----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Reva--------------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
VbB--------------- Vebar	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight.
VcC*:					
Vebar-------------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight.
Cohagen-----------	Slight-----------	Slight-----------	Slight-----------	Moderate: slope.	Moderate: frost action.
VcD*:					
Vebar-------------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Cohagen-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WaB*:					
Watrous-----------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.
Werner------------	Slight-----------	Moderate: shrink-swell.	Slight-----------	Moderate: shrink-swell, slope.	Severe: low strength.
WbB*:					
Watrous-----------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
WbB*:					
Rhoades	Moderate: too clayey, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
WdC*:					
Werner	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.
Reva	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
WeC*:					
Werner	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.
Watrous	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.
WhB*:					
Winler	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Hisle	Moderate: too clayey.	Severe: shrink-swell.	Slight	Severe: shrink-swell.	Severe: low strength, shrink-swell.
WsC*:					
Winler	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Lismas	Slight	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
ZaB Zeona	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
ZaD Zeona	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ZbC*:					
Zeona	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Blownout land.					
ZpB*:					
Zeona	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Parchin	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AaA, AaB: Amor	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
AcC*:					
Amor	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Cabba	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
AdC*:					
Amor	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Rhoades	Severe: thin layer, seepage, percs slowly.	Severe: seepage, slope.	Severe: seepage, too clayey.	Severe: depth to rock, seepage.	Poor: thin layer, too clayey, hard to pack.
AeB*:					
Amor	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Werner	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
AkA*:					
Archin	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Bullock	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Ar: Arnegard	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding.	Severe: flooding.	Fair: too clayey, wetness.
AsA, AsB: Assinniboine	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
AtA*:					
Assinniboine	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Archin	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
AwB: Attewan	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Ba*. Badlands					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BeC----------------- Boxwell	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim.
BkF----------------- Bullock	Severe: thin layer, seepage, percs slowly.	Severe: seepage, large stones, slope.	Severe: seepage, large stones.	Severe: seepage.	Poor: thin layer, large stones.
BnA*:					
Bullock------------	Severe: percs slowly.	Moderate: seepage.	Slight-----------	Slight-----------	Good.
Assinniboine-------	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
BoD*:					
Bullock------------	Severe: thin layer, seepage, percs slowly.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Cabbart------------	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
BpB*:					
Bullock------------	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Parchin------------	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Slickspots.					
BsA*:					
Bullock------------	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Slickspots.					
CaD*:					
Cabba--------------	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
Lantry-------------	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
Amor---------------	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CbD*:					
Cabba	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
Reeder	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
CcE Cabbart	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
CdE*:					
Cabbart	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
Delridge	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
CeE*:					
Cabbart	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
Rock outcrop.					
ChA Chinook	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
CnA*:					
Chinook	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Archin	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
CoE Cohagen	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
CrF*:					
Cohagen	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
Rock outcrop.					
Cabba Variant	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, depth to rock, slope.	Severe: seepage, slope.	Poor: thin layer, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
DcC*:					
Delridge	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Cabbart	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Du*. Dumps					
Dw*. Dune land					
EaA Eapa	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
EcA*:					
Eapa	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Archin	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
FaB Farnuf	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
FtE*:					
Fleak	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: thin layer, too sandy, slope.
Trey	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: thin layer, seepage, too sandy.
Rock outcrop.					
GdA Gerdrum	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
Ge Glendive	Moderate: flooding.	Severe: seepage, flooding.	Moderate: flooding, too sandy.	Moderate: flooding.	Fair: too sandy.
GhB*:					
Glendive	Moderate: flooding.	Severe: seepage, flooding.	Moderate: flooding, too sandy.	Moderate: flooding.	Fair: too sandy.
Archin	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: flooding.	Moderate: flooding.	Good.
GkA Grail	Severe: flooding, wetness, percs slowly.	Severe: wetness.	Severe: flooding.	Severe: flooding.	Fair: too clayey, wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GrA*:					
Grail	Severe: flooding, wetness, percs slowly.	Severe: wetness.	Severe: flooding.	Severe: flooding.	Fair: too clayey, wetness.
Daglum	Severe: percs slowly.	Moderate: seepage.	Severe: seepage, too clayey.	Moderate: seepage.	Poor: too clayey, excess sodium.
Ha, Hb: Hanly	Severe: poor filter.	Severe: seepage, flooding.	Severe: too sandy.	Moderate: flooding.	Poor: seepage, too sandy.
Hd*:					
Hanly	Severe: poor filter.	Severe: seepage, flooding.	Severe: too sandy.	Moderate: flooding.	Poor: seepage, too sandy.
Dogiecreek	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness, excess salt.
He*:					
Hanly	Severe: poor filter.	Severe: seepage, flooding.	Severe: too sandy.	Moderate: flooding.	Poor: seepage, too sandy.
Slickspots.					
Hf: Harlem	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: hard to pack.
Hg: Havre	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
Hh*:					
Havre	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
Harlem	Severe: percs slowly.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Poor: hard to pack.
Hk: Heil	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey, excess sodium.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
HsB*:					
Hisle	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer, hard to pack.
Slickspots.					
KcF*:					
Kirby	Severe: poor filter, slope.	Severe: seepage, slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: seepage, small stones, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
KcF*:					
Cabbart	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
Rock outcrop.					
Ke Korchea	Moderate: flooding.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
Kg Korchea	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Km*:					
Korchea	Moderate: flooding.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
Archin	Severe: percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
KoA Kremlin	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
KrA*:					
Kremlin	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Archin	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
KyB Kyle	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Poor: hard to pack.
Le Lallie	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
LhD*:					
Lismas	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer, hard to pack.
Hisle	Severe: thin layer, seepage, percs slowly.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer, hard to pack.
LkD*:					
Lismas	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, hard to pack, slope.
Winler	Severe: thin layer, seepage, percs slowly.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LrF*:					
Lismas	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, hard to pack, slope.
Rock outcrop.					
MaB Marmarth	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
McC*:					
Marmarth	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Cabbart	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
MpB*:					
Marmarth	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Parchin	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
MtC*, MtD*:					
Marmarth	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Twilight	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
NaD*:					
Nihill Variant	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: slope.	Poor: thin layer, too sandy, slope.
Attewan	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
PbB*:					
Parchin	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Bullock	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
PhA Parshall	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Pt*. Pits					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RbB----------------- Reeder	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
RcC*:					
Reeder-------------	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Cabba--------------	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
ReB*:					
Reeder-------------	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Rhoades------------	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage, too clayey.	Moderate: seepage.	Poor: thin layer, too clayey, hard to pack.
RfE*:					
Reva---------------	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, large stones, slope.
Slimbutte----------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
RgE*:					
Reva---------------	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, large stones, slope.
Rock outcrop.					
RhB----------------- Rhame	Severe: thin layer, seepage, depth to rock.	Severe: seepage.	Severe: seepage.	Severe: depth to rock, seepage.	Poor: thin layer.
RmB*:					
Rhame--------------	Severe: thin layer, seepage, depth to rock.	Severe: seepage.	Severe: seepage.	Severe: depth to rock, seepage.	Poor: thin layer.
Parchin------------	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
RnA*:					
Rhoades------------	Severe: percs slowly.	Slight-----------	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Daglum-------------	Severe: percs slowly.	Slight-----------	Severe: too clayey.	Slight-----------	Poor: too clayey, excess sodium.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RnB*:					
Rhoades	Severe: percs slowly.	Severe: seepage.	Severe: seepage, too clayey.	Severe: seepage.	Poor: thin layer, too clayey, hard to pack.
Daglum	Severe: percs slowly.	Severe: seepage.	Severe: seepage, too clayey.	Severe: seepage.	Poor: thin layer, too clayey, excess sodium.
RoF*. Rock outcrop					
RrF*: Rock outcrop.					
Reva	Severe: thin layer, seepage, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: thin layer, small stones, slopes.
RsF*:					
Rockoa	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Reva	Severe: thin layer, seepage, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, large stones, slope.
SaA Sage	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
SbA*:					
Sage	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: seepage, wetness.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Hisle Variant	Severe: thin layer, seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too clayey.	Severe: seepage, wetness.	Poor: thin layer, too clayey, hard to pack.
SgA Savage	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
ShB Shambo	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
SmB*:					
Shambo	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SmB*:					
Rhoades	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Sn*. Slickspots					
SpC*:					
Slimbutte	Moderate: percs slowly, slope, large stones.	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: seepage.	Poor: small stones.
Arnegard	Moderate: percs slowly.	Moderate: slope.	Slight	Slight	Good.
Reva	Severe: thin layer, seepage.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim, large stones.
SrE*:					
Slimbutte	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
Reva	Severe: thin layer, seepage, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, large stones, slope.
SwA Swanboy	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
SyA*:					
Swanboy	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
Slickspots.					
TnB Tanna	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Slight	Slight	Poor: thin layer, too clayey.
ToA*:					
Tanna	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Slight	Slight	Poor: thin layer, too clayey.
Gerdrum	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
ToC*:					
Tanna	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Slight	Slight	Poor: thin layer, too clayey.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ToC*:					
Rhoades	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage, too clayey.	Moderate: seepage.	Poor: too clayey, hard to pack.
TrB: Trey	Severe: thin layer, seepage, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: thin layer, seepage, too sandy.
TtC*:					
Trey	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: thin layer, seepage, too sandy.
Fleak	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: thin layer, too sandy.
TvB*:					
Trey	Severe: thin layer, seepage, poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: thin layer, seepage, too sandy.
Parchin	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Bullock	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
TwC: Twilight	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
TxE*:					
Twilight	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Blackhall	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
TyC*:					
Twilight	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Parchin	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
TzA Twotop	Severe: percs slowly.	Slight	Slight	Slight	Poor: hard to pack.
VaF*:					
Vanocker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Reva	Severe: thin layer, seepage, slope.	Severe: seepage, depth to rock, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
VbB Vebar	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
VcC*:					
Vebar	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Cohagen	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
VcD*:					
Vebar	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Cohagen	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
WaB*:					
Watrous	Severe: thin layer, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
Werner	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
WbB*:					
Watrous	Severe: thin layer, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
Rhoades	Severe: percs slowly.	Severe: seepage.	Severe: seepage, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
WdC*:					
Werner	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WdC*:					
Reva	Severe: thin layer, seepage.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, large stones.
WeC*:					
Werner	Severe: thin layer, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
Watrous	Severe: thin layer, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock.	Severe: depth to rock, seepage.	Poor: thin layer.
WhB*:					
Winler	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer, hard to pack.
Hisle	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer, hard to pack.
WsC*:					
Winler	Severe: thin layer, seepage, percs slowly.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer, hard to pack.
Lismas	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer, hard to pack.
ZaB Zeona	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
ZaD Zeona	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: slope.	Poor: seepage, too sandy, slope.
ZbC*:					
Zeona	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy.
Blownout land.					
ZpB*:					
Zeona	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
Parchin	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AaA, AaB------------- Amor	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
AcC*:				
Amor----------------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Cabba---------------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
AdC*:				
Amor----------------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Rhoades-------------	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
AeB*:				
Amor----------------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Werner--------------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
AkA*:				
Archin ------------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Bullock-------------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Ar------------------ Arnegard	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
AsA, AsB------------ Assinniboine	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
AtA*:				
Assinniboine--------	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Archin--------------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
AwB----------------- Attewan	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ba*. Badlands				
BeC: Boxwell	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
BkF: Bullock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
BnA*:				
Bullock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Assinniboine	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
BoD*:				
Bullock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Cabbart	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
BpB*:				
Bullock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Parchin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Slickspots.				
BsA*:				
Bullock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Slickspots.				
CaD*:				
Cabba	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Lantry	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Amor	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
CbD*:				
Cabba	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CbD*:				
Reeder	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
CcE Cabbart	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
CdE*:				
Cabbart	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
Delridge	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CeE*:				
Cabbart	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Rock outcrop.				
ChA Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CnA*:				
Chinook	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Archin	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
CoE Cohagen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
CrF*:				
Cohagen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Rock outcrop.				
Cabba Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
DcC*:				
Delridge	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
Cabbart	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Du*. Dumps				
Dw*. Dune land				
EaA: Eapa	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Slight.
EcA*:				
Eapa	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Slight.
Archin	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
FaB: Farnuf	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
FtE*:				
Fleak	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Trey	Poor: area reclaim.	Improbable: thin layer.	Improbable: too sandy.	Fair: area reclaim, too sandy, thin layer.
Rock outcrop.				
GdA: Gerdrum	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Ge: Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
GhB*:				
Glendive	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Archin	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
GkA: Grail	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
GrA*:				
Grail	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Daglum	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Ha, Hb: Hanly	Good	Probable	Improbable: too sandy.	Poor: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Hd*:				
Hanly	Good	Probable	Improbable: too sandy.	Poor: thin layer.
Dogiecreek	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
He*:				
Hanly	Good	Probable	Improbable: too sandy.	Poor: thin layer.
Slickspots.				
Hf Harlem	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Hg Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Hh*:				
Havre	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Harlem	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Hk Heil	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
HsB*:				
Hisle	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Slickspots.				
KcF*:				
Kirby	Poor: slope.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: small stones, area reclaim, slope.
Cabbart	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
Rock outcrop.				
Ke, Kg Korchea	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
Km*:				
Korchea	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Km*:				
Archin	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
KoA Kremlin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
KrA*:				
Kremlin	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Archin	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
KyB Kyle	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Le Lallie	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
LhD*:				
Lismas	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, thin layer.
Hisle	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
LkD*:				
Lismas	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, thin layer.
Winler	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LrF*:				
Lismas	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, thin layer.
Rock outcrop.				
MaB Marmarth	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
McC*:				
Marmarth	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
McC*:				
Cabbart	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
MpB*:				
Marmarth	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Parchin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
MtC*:				
Marmarth	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Twilight	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
MtD*:				
Marmarth	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Twilight	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
NaD*:				
Nihill Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Attewan	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
PbB*:				
Parchin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Bullock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
PhA Parshall	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Pt*. Pits				
RbB Reeder	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RcC*:				
Reeder	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Cabba	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
ReB*:				
Reeder	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Rhoades	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
RfE*:				
Reva	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
Slimbutte	Poor: slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
RgE*:				
Reva	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
Rock outcrop.				
RhB Rhame	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
RmB*:				
Rhame	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Parchin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
RnA*:				
Rhoades	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Daglum	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
RnB*:				
Rhoades	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RnB*:				
Daglum	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
RoF*. Rock outcrop				
RrF*: Rock outcrop.				
Reva	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
RsF*:				
Rockoa	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Reva	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
SaA Sage	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
SbA*:				
Sage	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
Hisle Variant	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
SgA Savage	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ShB Shambo	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
SmB*:				
Shambo	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Rhoades	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Sn*. Slickspots				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SpC*:				
Slimbutte	Fair: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones.
Arnegard	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Reva	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
SrE*:				
Slimbutte	Fair: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
Reva	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
SwA Swanboy	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SyA*:				
Swanboy	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Slickspots.				
TnB Tanna	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, thin layer.
ToA*:				
Tanna	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, thin layer.
Gerdrum	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
ToC*:				
Tanna	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, thin layer.
Rhoades	Poor: area reclaim, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
TrB Trey	Poor: area reclaim.	Improbable: thin layer.	Improbable: too sandy.	Fair: area reclaim, too sandy, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
TtC*:				
Trey	Poor: area reclaim.	Improbable: thin layer.	Improbable: too sandy.	Fair: area reclaim, too sandy, thin layer.
Fleak	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
TvB*:				
Trey	Poor: area reclaim.	Improbable: thin layer.	Improbable: too sandy.	Fair: area reclaim, too sandy, thin layer.
Parchin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Bullock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
TwC Twilight	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
TxE*:				
Twilight	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
Blackhall	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
TyC*:				
Twilight	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
Parchin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
TzA Twotop	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
VaF*:				
Vanocker	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Reva	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
VbB Vebar	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
VcC*:				
Vebar	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Cohagen	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
VcD*:				
Vebar	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
Cohagen	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, slope.
WaB*:				
Watrous	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
Werner	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
WbB*:				
Watrous	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
Rhoades	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
WdC*:				
Werner	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
Reva	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, small stones.
WeC*:				
Werner	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
Watrous	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WhB*:				
Winler	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Hisle	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
WsC*:				
Winler	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Lismas	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, thin layer.
ZaB Zeona	Good	Probable	Improbable: too sandy.	Fair: too sandy.
ZaD Zeona	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
ZbC*:				
Zeona	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
Blownout land.				
ZpB*:				
Zeona	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Parchin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
AaA: Amor	Moderate: seepage.	Severe: piping.	Deep to water, thin layer.	Thin layer	Area reclaim	Area reclaim.
AaB: Amor	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Thin layer, slope.	Area reclaim	Area reclaim.
AcC*:						
Amor	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Thin layer, slope.	Area reclaim	Area reclaim.
Cabba	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Thin layer, slope.	Area reclaim	Area reclaim.
AdC*:						
Amor	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Thin layer, slope.	Area reclaim	Area reclaim.
Rhoades	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Slope, percs slowly, thin layer.	Area reclaim, percs slowly.	Excess sodium, area reclaim, percs slowly.
AeB*:						
Amor	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Thin layer, slope.	Area reclaim	Area reclaim.
Werner	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Thin layer, slope.	Area reclaim	Area reclaim.
AkA*:						
Archin	Moderate: seepage.	Severe: excess sodium.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing.	Excess sodium, erodes easily.
Bullock	Moderate: seepage.	Severe: excess sodium.	Deep to water, thin layer.	Droughty, soil blowing.	Erodes easily	Excess sodium, erodes easily, area reclaim.
Ar: Arnegard	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
AsA: Assinniboine	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
AsB: Assinniboine	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
AtA*:						
Assinniboine	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
Archin	Moderate: seepage.	Severe: excess sodium.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing.	Excess sodium, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
AwB: Attewan	Severe: seepage.	Severe: seepage.	Deep to water	Rooting depth, slope.	Favorable	Rooting depth.
Ba*. Badlands						
BeC: Boxwell	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Thin layer, slope.	Area reclaim	Area reclaim.
BkF: Bullock	Moderate: seepage, slope.	Severe: thin layer, piping, excess sodium.	Deep to water, thin layer.	Soil blowing, percs slowly, thin layer.	Area reclaim, soil blowing.	Excess sodium, area reclaim.
BnA*:						
Bullock	Moderate: seepage.	Severe: excess sodium.	Deep to water	Droughty, soil blowing.	Erodes easily	Excess sodium, erodes easily.
Assinniboine	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
BoD*:						
Bullock	Severe: slope.	Severe: thin layer, excess sodium.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Slope, area reclaim, erodes easily.	Slope, excess sodium, erodes easily.
Cabbart	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
BpB*:						
Bullock	Moderate: seepage, slope.	Severe: thin layer, excess sodium.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
Parchin	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Soil blowing, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
Slickspots.						
BsA*:						
Bullock	Moderate: seepage.	Severe: thin layer, excess sodium.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
Slickspots.						
CaD*:						
Cabba	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Lantry	Severe: slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer, erodes easily.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
Amor	Severe: slope.	Severe: piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
CbD*:						
Cabba	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Reeder	Severe: slope.	Severe: piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
CcE Cabbart	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer, excess salt.	Slope, area reclaim.	Slope, area reclaim.
CdE*:						
Cabbart	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Delridge	Severe: slope.	Severe: thin layer.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
CeE*:						
Cabbart	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Rock outcrop.						
ChA Chinook	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing	Droughty.
CnA*:						
Chinook	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing	Droughty.
Archin	Moderate: seepage.	Severe: excess sodium.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing.	Excess sodium, erodes easily.
CoE Cohagen	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Slope, area reclaim, soil blowing.	Slope, area reclaim.
CrF*:						
Cohagen	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Slope, area reclaim, soil blowing.	Slope, area reclaim.
Rock outcrop.						
Cabba Variant	Severe: depth to rock, seepage, slope.	Severe: thin layer.	Deep to water, thin layer.	Slope, thin layer.	Slope, depth to rock, area reclaim.	Slope, depth to rock, area reclaim.
DcC*:						
Delridge	Severe: slope.	Severe: thin layer.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Cabbart	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Du*. Dumps						

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Dw*. Dune land						
EaA: Eapa	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
EcA*: Eapa	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Archin	Moderate: seepage.	Severe: excess sodium.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing.	Excess sodium, erodes easily.
FaB: Farnuf	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
FtE*: Fleak	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Droughty, fast intake, soil blowing.	Slope, area reclaim, too sandy.	Slope, droughty, area reclaim.
Trey	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water, thin layer.	Droughty, fast intake, soil blowing.	Slope, area reclaim, too sandy.	Slope, droughty, area reclaim.
Rock outcrop.						
GdA: Gerdrum	Moderate: seepage.	Severe: excess sodium.	Deep to water	Droughty, percs slowly.	Erodes easily, percs slowly.	Excess sodium, erodes easily.
Ge: Glendive	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing	Droughty.
GhB*: Glendive	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing, slope.	Soil blowing	Droughty.
Archin	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water	Soil blowing, percs slowly, slope.	Erodes easily, soil blowing.	Excess sodium, erodes easily.
GkA: Grail	Slight	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
GrA*: Grail	Slight	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
Daglum	Slight	Severe: excess sodium.	Deep to water	Percs slowly	Percs slowly	Excess sodium, percs slowly.
Ha: Hanly	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty	Too sandy, soil blowing.	Droughty.
Hb: Hanly	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Hd*:						
Hanly	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty	Too sandy, soil blowing.	Droughty.
Dogiecreek	Severe: seepage.	Severe: piping, wetness, excess salt.	Flooding, frost action, excess salt.	Wetness, soil blowing, excess salt.	Wetness, soil blowing.	Wetness, excess salt.
He*:						
Hanly	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Slickspots.						
Hf Harlem	Slight	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Hg Havre	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Hh*:						
Havre	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Harlem	Slight	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Hk Heil	Slight	Severe: hard to pack, ponding, excess sodium.	Ponding, percs slowly, excess salt.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, excess sodium, percs slowly.
HsB*:						
Hisle	Moderate: seepage, slope.	Severe: hard to pack, excess sodium.	Deep to water, thin layer.	Droughty, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
Slickspots.						
KcF*:						
Kirby	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Cabbart	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
Rock outcrop.						
Ke Korchea	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Kg Korchea	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Km*:						
Korchea	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Archin	Moderate: seepage.	Severe: excess sodium.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing.	Excess sodium, erodes easily.
KoA Kremlin	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
KrA*:						
Kremlin	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Archin	Moderate: seepage.	Severe: excess sodium.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing.	Excess sodium, erodes easily.
KyB Kyle	Moderate: slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty.
Le Lallie	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, excess salt, erodes easily.
LhD*:						
Lismas	Severe: seepage, slope.	Severe: thin layer, hard to pack.	Deep to water, thin layer.	Droughty, slow intake, percs slowly.	Slope, area reclaim, erodes easily.	Slope, erodes easily, droughty.
Hisle	Moderate: seepage, slope.	Severe: hard to pack, excess sodium.	Deep to water, thin layer.	Droughty, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
LkD*:						
Lismas	Severe: seepage, slope.	Severe: thin layer, hard to pack.	Deep to water, thin layer.	Droughty, slow intake, percs slowly.	Slope, area reclaim, erodes easily.	Slope, erodes easily, droughty.
Winler	Severe: slope.	Severe: thin layer, hard to pack.	Deep to water, thin layer.	Slow intake, droughty, percs slowly.	Slope, area reclaim, erodes easily.	Slope, erodes easily, droughty.
LrF*:						
Lismas	Severe: seepage, slope.	Severe: thin layer, hard to pack.	Deep to water, thin layer.	Droughty, slow intake, percs slowly.	Slope, area reclaim, erodes easily.	Slope, erodes easily, droughty.
Rock outcrop.						
MaB Marmarth	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.
McC*:						
Marmarth	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.
Cabbart	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Area reclaim	Area reclaim.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
MpB*:						
Marmarth	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.
Parchin	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Soil blowing, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
MtC*:						
Marmarth	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.
Twilight	Severe: seepage.	Severe: piping.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Area reclaim, soil blowing.	Droughty, area reclaim.
MtD*:						
Marmarth	Severe: slope.	Severe: piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Slope, area reclaim, soil blowing.	Slope, area reclaim.
Twilight	Severe: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Slope, area reclaim, soil blowing.	Slope, droughty, area reclaim.
NaD*:						
Nihill Variant	Severe: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Droughty, slope, thin layer.	Slope, area reclaim, too sandy.	Slope, droughty, area reclaim.
Attewan	Severe: seepage.	Severe: seepage.	Deep to water	Rooting depth, slope.	Favorable	Rooting depth.
PbB*:						
Parchin	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Soil blowing, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
Bullock	Moderate: seepage, slope.	Severe: thin layer, excess sodium.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
PhA: Parshall	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Too sandy, soil blowing.	Favorable.
Pt*. Pits						
RbB: Reeder	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Slope, thin layer.	Area reclaim	Area reclaim.
RcC*:						
Reeder	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Slope, thin layer.	Area reclaim	Area reclaim.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
RcC*:						
Cabba	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Area reclaim	Area reclaim.
ReB*:						
Reeder	Moderate: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Slope, thin layer.	Area reclaim	Area reclaim.
Rhoades	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Percs slowly, slope, thin layer.	Area reclaim, percs slowly.	Excess sodium, percs slowly,
RfE*:						
Reva	Severe: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water, thin layer.	Large stones, droughty, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Slimbutte	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, rooting depth.	Slope, large stones.	Large stones, slope, droughty.
RgE*:						
Reva	Severe: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water, thin layer.	Large stones, droughty, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
RhB Rhame	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.
RmB*:						
Rhame	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.
Parchin	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Soil blowing, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
RnA*:						
Rhoades	Slight	Severe: excess sodium.	Deep to water	Percs slowly	Percs slowly	Excess sodium, percs slowly.
Daglum	Slight	Severe: excess sodium.	Deep to water	Percs slowly	Percs slowly	Excess sodium, percs slowly.
RnB*:						
Rhoades	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Percs slowly, slope, thin layer.	Area reclaim, percs slowly.	Excess sodium, percs slowly, area reclaim.
Daglum	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Percs slowly, slope, thin layer.	Area reclaim, percs slowly.	Excess sodium, percs slowly, area reclaim.
RoF*. Rock outcrop						

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
RrF*: Rock outcrop.						
Reva	Severe: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water, thin layer.	Large stones, droughty, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
RsF*: Rockoa	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Slope, large stones.	Slope, large stones.	Large stones, slope.
Reva	Severe: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water, thin layer.	Large stones, droughty, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
SaA: Sage	Moderate: seepage.	Severe: hard to pack, wetness, excess salt.	Percs slowly, flooding, frost action.	Wetness, droughty.	Wetness, percs slowly.	Wetness, excess salt, droughty.
SbA*: Sage	Moderate: seepage.	Severe: hard to pack, wetness, excess salt.	Percs slowly, frost action.	Wetness, droughty.	Wetness, percs slowly.	Wetness, excess salt, droughty.
Hisle Variant	Moderate: seepage.	Severe: hard to pack.	Percs slowly, thin layer, excess salt.	Wetness, droughty, percs slowly.	Area reclaim, erodes easily, wetness.	Wetness, erodes easily, droughty.
SgA: Savage	Slight	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
ShB: Shambo	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
SmB*: Shambo	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
Rhoades	Moderate: slope.	Severe: excess sodium.	Deep to water	Percs slowly, slope.	Percs slowly	Excess sodium, percs slowly.
Sn*. Slickspots						
SpC*: Slimbutte	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, rooting depth.	Slope, large stones.	Large stones, slope, droughty.
Arnegard	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
SpC*:						
Reva	Severe: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water, thin layer.	Large stones, droughty, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
SrE*:						
Slimbutte	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, rooting depth.	Slope, large stones.	Large stones, slope, droughty.
Reva	Severe: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water, thin layer.	Large stones, droughty, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
SwA Swanboy	Slight	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty.
SyA*:						
Swanboy	Slight	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty.
Slickspots.						
TnB Tanna	Severe: seepage.	Moderate: thin layer.	Deep to water, thin layer.	Percs slowly, slope, thin layer.	Area reclaim, erodes easily.	Erodes easily, area reclaim.
ToA*:						
Tanna	Severe: seepage.	Moderate: thin layer.	Deep to water, thin layer.	Percs slowly, thin layer.	Area reclaim, erodes easily.	Erodes easily, area reclaim.
Gerdrum	Moderate: seepage.	Severe: excess sodium.	Deep to water	Droughty, percs slowly.	Erodes easily, percs slowly.	Excess sodium, erodes easily.
ToC*:						
Tanna	Severe: seepage.	Moderate: thin layer.	Deep to water, thin layer.	Percs slowly, slope, thin layer.	Area reclaim, erodes easily.	Erodes easily, area reclaim.
Rhoades	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Percs slowly, slope, thin layer.	Area reclaim, percs slowly.	Excess sodium, percs slowly, area reclaim.
TrB Trey	Severe: seepage.	Severe: seepage, piping.	Deep to water, thin layer.	Droughty, fast intake, soil blowing.	Area reclaim, too sandy.	Droughty, area reclaim.
TtC*:						
Trey	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water, thin layer.	Droughty, fast intake, soil blowing.	Slope, area reclaim, too sandy.	Slope, droughty, area reclaim.
Fleak	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Droughty, fast intake, soil blowing.	Slope, area reclaim, too sandy.	Slope, droughty, area reclaim.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
TvB*:						
Trey	Severe: seepage.	Severe: seepage, piping.	Deep to water, thin layer.	Droughty, fast intake, soil blowing.	Area reclaim, too sandy.	Droughty, area reclaim.
Parchin	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Soil blowing, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
Bullock	Moderate: seepage, slope.	Severe: thin layer, excess sodium.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
TwC Twilight	Severe: seepage.	Severe: piping.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Area reclaim, soil blowing.	Droughty, area reclaim.
TxE*:						
Twilight	Severe: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Slope, area reclaim, soil blowing.	Slope, droughty, area reclaim.
Blackhall	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Slope, area reclaim.	Slope, area reclaim.
TyC*:						
Twilight	Severe: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Droughty, soil blowing, thin layer.	Slope, area reclaim, soil blowing.	Slope, droughty, area reclaim.
Parchin	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Soil blowing, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
TzA Twotop	Slight	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty.
VaF*:						
Vanocker	Severe: slope.	Severe: piping.	Deep to water	Slope, droughty.	Slope, large stones.	Large stones, slope, droughty.
Reva	Severe: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water, thin layer.	Large stones, droughty, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
VbB Vebar	Severe: seepage.	Severe: piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.
VcC*:						
Vebar	Severe: seepage.	Severe: piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.
Cohagen	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Area reclaim, soil blowing.	Area reclaim.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
VcD*:						
Vebar----------	Severe: seepage, slope.	Severe: piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Slope, area reclaim, soil blowing.	Slope, area reclaim.
Cohagen----------	Severe: seepage, slope.	Severe: thin layer, piping.	Deep to water, thin layer.	Soil blowing, slope, thin layer.	Slope, area reclaim, soil blowing.	Slope, area reclaim.
WaB*:						
Watrous----------	Moderate: depth to rock, seepage, slope.	Severe: thin layer.	Deep to water, thin layer.	Slope, thin layer.	Depth to rock, area reclaim.	Depth to rock, area reclaim.
Werner----------	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Area reclaim---	Area reclaim.
WbB*:						
Watrous----------	Moderate: depth to rock, seepage, slope.	Severe: thin layer.	Deep to water, thin layer.	Slope, thin layer.	Depth to rock, area reclaim.	Depth to rock, area reclaim.
Rhoades----------	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Percs slowly, slope, thin layer.	Area reclaim, percs slowly.	Excess sodium, percs slowly, area reclaim.
WdC*:						
Werner----------	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Area reclaim---	Area reclaim.
Reva----------	Severe: depth to rock, seepage.	Severe: thin layer.	Deep to water, thin layer.	Large stones, droughty, thin layer.	Large stones, depth to rock, area reclaim.	Large stones, droughty, area reclaim.
WeC*:						
Werner----------	Severe: seepage.	Severe: thin layer, piping.	Deep to water, thin layer.	Slope, thin layer.	Area reclaim---	Area reclaim.
Watrous----------	Moderate: depth to rock, seepage, slope.	Severe: thin layer.	Deep to water, thin layer.	Slope, thin layer.	Depth to rock, area reclaim.	Depth to rock, area reclaim.
WhB*:						
Winler----------	Moderate: seepage, slope.	Severe: thin layer, hard to pack.	Deep to water, thin layer.	Slow intake, droughty, percs slowly.	Area reclaim, erodes easily.	Erodes easily, droughty, area reclaim.
Hisle----------	Moderate: seepage, slope.	Severe: hard to pack, excess sodium.	Deep to water, thin layer.	Droughty, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.
WsC*:						
Winler----------	Moderate: seepage, slope.	Severe: thin layer, hard to pack.	Deep to water, thin layer.	Slow intake, droughty, percs slowly.	Area reclaim, erodes easily.	Erodes easily, droughty, area reclaim.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
WsC*:						
Lismas-----------	Severe: seepage, slope.	Severe: thin layer, hard to pack.	Deep to water, thin layer.	Droughty, slow intake, percs slowly.	Slope, area reclaim, erodes easily.	Slope, erodes easily, droughty.
ZaB--------------- Zeona	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
ZaD--------------- Zeona	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
ZbC*:						
Zeona------------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Blownout land.						
ZpB*:						
Zeona------------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Parchin----------	Moderate: seepage, slope.	Severe: excess sodium.	Deep to water, thin layer.	Soil blowing, percs slowly, thin layer.	Area reclaim, erodes easily.	Excess sodium, erodes easily, area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AaA, AaB--------- Amor	0-8	Loam--------------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	65-85	25-40	3-18
	8-34	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	75-100	50-95	20-45	2-25
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
AcC*: Amor-------------	0-8	Loam--------------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	65-85	25-40	3-18
	8-34	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	75-100	50-95	20-45	2-25
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cabba------------	0-2	Loam--------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	70-90	60-85	20-35	5-15
	2-15	Loam, silt loam, gravelly loam.	CL-ML, CL	A-4, A-6	0-5	90-100	90-100	70-90	60-85	20-35	5-20
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
AdC*: Amor-------------	0-8	Loam--------------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	65-85	25-40	3-18
	8-34	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	75-100	50-95	20-45	2-25
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rhoades----------	0-2	Loam--------------	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	2-15	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-32	Silty clay, clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
AeB*: Amor-------------	0-8	Loam--------------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	65-85	25-40	3-18
	8-34	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	75-100	50-95	20-45	2-25
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Werner-----------	0-6	Loam--------------	CL-ML, CL, SM-SC, SC	A-4, A-6	0-5	90-100	85-100	80-95	35-90	25-40	5-20
	6-13	Loam, very fine sandy loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	80-95	50-90	25-50	5-25
	13-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
AkA*: Archin-----------	0-4	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	40-60	20-30	NP-7
	4-6	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	90-100	40-70	<30	NP-10
	6-17	Loam, clay loam, sandy clay loam.	CL, SC, CH	A-6, A-7	0	100	100	90-100	45-80	35-65	15-40
	17-28	Loam, sandy clay loam, fine sandy loam.	SC, CL	A-6, A-7	0	100	100	90-100	45-90	30-50	10-25
	28-60	Loam, fine sandy loam.	CL, SC	A-4, A-6, A-7	0	95-100	95-100	90-100	40-70	25-45	8-20

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
AkA*:											
Bullock	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	40-65	25-35	NP-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-4, A-6, A-7	0	100	100	90-100	40-70	30-45	8-20
	9-20	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-70	30-50	10-30
	20-60	Sandy loam, very fine sandy loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
Ar: Arnegard	0-9	Loam	CL-ML, CL	A-4, A-6	0	100	100	90-100	60-95	20-35	5-20
	9-23	Loam, silt loam, clay loam.	CL	A-6	0	100	100	90-100	60-95	25-40	12-25
	23-60	Loam, clay loam, fine sandy loam.	SM, ML, CL, SC	A-4, A-6	0	100	100	75-95	40-80	15-40	NP-15
AsA, AsB: Assinniboine	0-8	Fine sandy loam	SM	A-4, A-2	0	100	100	70-95	30-50	15-25	NP-5
	8-18	Sandy clay loam, loam.	SC, CL	A-6	0	100	100	80-95	35-70	25-35	10-20
	18-43	Loam, fine sandy loam, sandy loam.	SC, SM-SC, CL-ML, CL	A-4, A-6	0	100	100	60-95	40-70	20-35	5-20
	43-60	Fine sandy loam, sandy loam, loamy sand.	SM	A-4, A-2	0	100	100	60-85	25-45	20-30	NP-10
AtA*:											
Assinniboine	0-8	Fine sandy loam	SM	A-4, A-2	0	100	100	70-95	30-50	15-25	NP-5
	8-18	Sandy clay loam, loam.	SC, CL	A-6	0	100	100	80-95	35-70	25-35	10-20
	18-43	Loam, fine sandy loam, sandy loam.	SC, SM-SC, CL-ML, CL	A-4, A-6	0	100	100	60-95	40-70	20-35	5-20
	43-60	Fine sandy loam, sandy loam, loamy sand.	SM	A-4, A-2	0	100	100	60-85	25-45	20-30	NP-10
Archin	0-4	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	40-60	20-30	NP-7
	4-6	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	90-100	40-70	<30	NP-10
	6-17	Loam, clay loam, sandy clay loam.	CL, SC, CH	A-6, A-7	0	100	100	90-100	45-80	35-65	15-40
	17-28	Loam, sandy clay loam, fine sandy loam.	SC, CL	A-6, A-7	0	100	100	90-100	45-90	30-50	10-25
	28-60	Loam, fine sandy loam.	CL, SC	A-4, A-6, A-7	0	95-100	95-100	90-100	40-70	25-45	8-20
AwB: Attewan	0-5	Loam	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-95	60-70	25-35	5-15
	5-20	Loam, clay loam	CL	A-6	0-5	95-100	95-100	75-95	60-85	30-40	10-20
	20-32	Loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	85-95	60-85	25-35	5-15
	32-60	Gravelly loamy fine sand, very gravelly loamy sand.	SM, GM	A-1	5-10	10-65	10-60	10-30	10-20	<20	NP
Ba*. Badlands											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BeC-------------- Boxwell	0-7	Loam------------	CL-ML, CL	A-4, A-6	0	100	100	85-95	60-85	20-35	5-20
	7-12	Loam------------	CL-ML, CL	A-4, A-6	0	100	100	85-95	60-85	20-35	5-20
	12-31	Loam------------	CL-ML, CL	A-4, A-6	0	100	100	85-95	60-85	20-35	5-20
	31-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
BkF-------------- Bullock	0-4	Fine sandy loam	SM	A-4	10-35	95-100	95-100	85-95	35-50	20-30	NP-7
	4-20	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	10-35	100	100	80-95	40-80	30-45	10-20
	20-29	Clay loam, very fine sandy loam, sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	0	100	100	75-95	35-80	20-40	5-15
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
BnA*:											
Bullock---------	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	40-65	25-35	NP-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-4, A-6, A-7	0	100	100	90-100	40-70	30-45	8-20
	9-20	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-70	30-50	10-30
	20-60	Sandy loam, very fine sandy loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
Assinniboine----	0-8	Fine sandy loam	SM	A-4, A-2	0	100	100	70-95	30-50	15-25	NP-5
	8-18	Sandy clay loam, loam.	SC, CL	A-6	0	100	100	80-95	35-70	25-35	10-20
	18-43	Loam, fine sandy loam, sandy loam.	SC, SM-SC, CL-ML, CL	A-4, A-6	0	100	100	60-95	40-70	20-35	5-20
	43-60	Fine sandy loam, sandy loam, loamy sand.	SM	A-4, A-2	0	100	100	60-85	25-45	20-30	NP-10
BoD*:											
Bullock---------	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	40-65	25-35	NP-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-4, A-6, A-7	0	100	100	90-100	40-70	30-45	8-20
	9-20	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-70	30-50	10-30
	20-29	Sandy loam, very fine sandy loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cabbart---------	0-4	Loam------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	65-85	20-35	5-20
	4-11	Loam------------	CL-ML, CL	A-4, A-6	0	90-100	90-100	85-95	65-85	20-35	5-15
	11-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
BpB*:											
Bullock---------	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	40-65	25-35	NP-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-4, A-6, A-7	0	100	100	90-100	40-70	30-45	8-20
	9-20	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-70	30-50	10-30
	20-29	Sandy loam, very fine sandy loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BpB*:											
Parchin---------	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	35-60	20-30	NP-7
	5-10	Fine sandy loam, loamy fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	90-100	30-60	<30	NP-7
	10-18	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	18-34	Fine sandy loam, clay loam, sandy clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	40-60	30-50	10-30
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Slickspots.											
BsA*:											
Bullock---------	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	40-65	25-35	NP-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-4, A-6, A-7	0	100	100	90-100	40-70	30-45	8-20
	9-20	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-70	30-50	10-30
	20-29	Sandy loam, very fine sandy loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Slickspots.											
CaD*:											
Cabba-----------	0-2	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	70-90	60-85	20-35	5-15
	2-15	Loam, silt loam, gravelly loam.	CL-ML, CL	A-4, A-6	0-5	90-100	90-100	70-90	60-85	20-35	5-20
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Lantry----------	0-4	Loam-------------	CL, ML	A-4, A-6	0	100	100	95-100	60-85	30-40	5-15
	4-28	Silt loam, loam, very fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	75-100	20-40	3-15
	28-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Amor------------	0-8	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	65-85	25-40	3-18
	8-34	Clay loam, loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	75-100	50-95	20-45	2-25
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
CbD*:											
Cabba-----------	0-2	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	70-90	60-85	20-35	5-15
	2-15	Loam, silt loam, gravelly loam.	CL-ML, CL	A-4, A-6	0-5	90-100	90-100	70-90	60-85	20-35	5-20
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Reeder----------	0-6	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	6-30	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
CcE------------- Cabbart	0-4	Loam-------------	ML, CL-ML, SM, SM-SC	A-4	40-45	95-100	90-100	65-85	45-65	20-35	5-15
	4-11	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	60-90	55-85	25-35	5-15
	11-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CdE*:											
Cabbart----------	0-4	Loam--------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	65-85	20-35	5-20
	4-11	Loam--------------	CL-ML, CL	A-4, A-6	0	90-100	90-100	85-95	65-85	20-35	5-15
	11-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Delridge---------	0-5	Loam--------------	CL, ML, SM, SC	A-4, A-6	0	95-100	95-100	85-100	35-90	30-40	5-15
	5-25	Loam, silt loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	85-100	65-90	30-45	10-20
	25-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
CeE*:											
Cabbart----------	0-4	Loam--------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	65-85	20-35	5-20
	4-11	Loam--------------	CL-ML, CL	A-4, A-6	0	90-100	90-100	85-95	65-85	20-35	5-15
	11-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
ChA--------------- Chinook	0-6	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	100	85-95	35-55	15-25	NP-10
	6-25	Fine sandy loam, sandy loam.	SM, SM-SC	A-4	0	100	100	85-95	35-45	15-25	NP-10
	25-60	Fine sandy loam, sandy loam, loamy fine sand.	SM, SM-SC	A-4, A-2	0	100	100	70-95	25-40	15-25	NP-10
CnA*:											
Chinook----------	0-6	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	100	85-95	35-55	15-25	NP-10
	6-25	Fine sandy loam, sandy loam.	SM, SM-SC	A-4	0	100	100	85-95	35-45	15-25	NP-10
	25-60	Fine sandy loam, sandy loam, loamy fine sand.	SM, SM-SC	A-4, A-2	0	100	100	70-95	25-40	15-25	NP-10
Archin-----------	0-4	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	40-60	20-30	NP-7
	4-6	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	90-100	40-70	<30	NP-10
	6-17	Loam, clay loam, sandy clay loam.	CL, SC, CH	A-6, A-7	0	100	100	90-100	45-80	35-65	15-40
	17-28	Loam, sandy clay loam, fine sandy loam.	SC, CL	A-6, A-7	0	100	100	90-100	45-90	30-50	10-25
	28-60	Loam, fine sandy loam.	CL, SC	A-4, A-6, A-7	0	95-100	95-100	90-100	40-70	25-45	8-20
CoE--------------- Cohagen	0-16	Fine sandy loam	SM	A-2, A-4	0	100	95-100	60-85	30-50	---	NP
	16-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
CrF*:											
Cohagen----------	0-11	Fine sandy loam	SM	A-2, A-4	0	100	95-100	60-85	30-50	---	NP
	11-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Cabba Variant----	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	3-16	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-50	11-25
	16-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DcC*:											
Delridge	0-5	Loam	CL, ML, SM, SC	A-4, A-6	0	95-100	95-100	85-100	35-90	30-40	5-15
	5-25	Loam, silt loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	85-100	65-90	30-45	10-20
	25-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cabbart	0-4	Loam	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	65-85	20-35	5-20
	4-11	Loam	CL-ML, CL	A-4, A-6	0	90-100	90-100	85-95	65-85	20-35	5-15
	11-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Du*. Dumps											
Dw*. Dune land											
EaA Eapa	0-4	Loam	CL, ML	A-4, A-6, A-7	0-5	95-100	85-100	80-95	55-85	30-45	7-20
	4-13	Clay loam, loam	CL, ML	A-6, A-7	0-5	95-100	85-100	75-95	55-85	35-50	10-25
	13-34	Loam, sandy clay loam, clay loam.	CL	A-4, A-6, A-7	0-5	95-100	85-100	75-95	55-85	30-45	8-20
	34-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	95-100	80-100	75-95	50-80	30-45	8-20
EcA*:											
Eapa	0-4	Loam	CL, ML	A-4, A-6, A-7	0-5	95-100	85-100	80-95	55-85	30-45	7-20
	4-13	Clay loam, loam	CL, ML	A-6, A-7	0-5	95-100	85-100	75-95	55-85	35-50	10-25
	13-34	Loam, sandy clay loam, clay loam.	CL	A-4, A-6, A-7	0-5	95-100	85-100	75-95	55-85	30-45	8-20
	34-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	95-100	80-100	75-95	50-80	30-45	8-20
Archin	0-4	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	40-60	20-30	NP-7
	4-6	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	90-100	40-70	<30	NP-10
	6-17	Loam, clay loam, sandy clay loam.	CL, SC, CH	A-6, A-7	0	100	100	90-100	45-80	35-65	15-40
	17-28	Loam, sandy clay loam, fine sandy loam.	SC, CL	A-6, A-7	0	100	100	90-100	45-90	30-50	10-25
	28-60	Loam, fine sandy loam.	CL, SC	A-4, A-6, A-7	0	95-100	95-100	90-100	40-70	25-45	8-20
FaB Farnuf	0-5	Loam	CL-ML, CL	A-4, A-6	0	100	100	85-95	65-80	25-40	5-20
	5-19	Loam, clay loam	CL	A-6, A-7	0	100	100	80-95	70-85	35-50	15-25
	19-35	Loam, clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	80-95	70-95	35-50	15-25
	35-60	Loam, clay loam, silty clay loam.	CL, CL-ML	A-6, A-7, A-2	0	100	100	75-95	70-95	25-50	5-25
FtE*:											
Fleak	0-5	Loamy fine sand	SM	A-2, A-4	0-5	95-100	95-100	45-80	20-40	---	NP
	5-16	Fine sand, loamy fine sand.	SM	A-2, A-4	0-5	95-100	95-100	40-85	20-40	---	NP
	16-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Trey	0-4	Loamy fine sand	SM, SM-SC	A-2	0	100	100	55-85	15-35	<25	NP-5
	4-30	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-30	<25	NP
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FtE*: Rock outcrop.											
GdA------------- Gerdrum	0-2	Silt loam--------	CL-ML	A-4	0	80-100	75-100	60-90	50-80	25-30	5-10
	2-36	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	90-100	90-100	85-100	75-95	40-60	20-40
	36-60	Clay loam, sandy clay loam, clay.	CL, SC, CH	A-6, A-7	0	90-100	90-100	80-95	45-75	35-55	15-35
Ge--------------- Glendive	0-8	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	35-55	20-30	NP-10
	8-60	Stratified loamy fine sand to clay loam.	SM, SM-SC	A-4, A-2	0	100	100	70-80	25-50	15-30	NP-10
GhB*: Glendive--------	0-8	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	35-55	20-30	NP-10
	8-60	Stratified loamy fine sand to clay loam.	SM, SM-SC	A-4, A-2	0	100	100	70-80	25-50	15-30	NP-10
Archin----------	0-4	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	40-60	20-30	NP-7
	4-6	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	90-100	40-70	<30	NP-10
	6-17	Loam, clay loam, sandy clay loam.	CL, SC, CH	A-6, A-7	0	100	100	90-100	45-80	35-65	15-40
	17-28	Loam, sandy clay loam, fine sandy loam.	SC, CL	A-6, A-7	0	100	100	90-100	45-90	30-50	10-25
	28-60	Loam, fine sandy loam.	CL, SC	A-4, A-6, A-7	0	95-100	95-100	90-100	40-70	25-45	8-20
GkA-------------- Grail	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-15
	6-27	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	27-60	Silty clay loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	80-100	30-45	5-20
GrA*: Grail-----------	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-15
	6-27	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	27-60	Silty clay loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	80-100	30-45	5-20
Daglum----------	0-8	Loam-------------	SM, ML, CL-ML, SM-SC	A-4	0	100	100	75-90	45-65	20-30	3-10
	8-19	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-75	15-45
	19-60	Clay, silty clay, clay loam.	CL	A-7	0	100	100	90-100	65-95	40-50	20-30
Ha--------------- Hanly	0-6	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	<25	NP-5
	6-60	Stratified fine sandy loam to sand.	SM, SP-SM	A-2, A-3	0	100	100	50-85	5-25	<25	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Hb--------------- Hanly	0-5	Loamy fine sand	SM	A-2	0	100	100	50-75	15-30	<25	NP
	5-60	Stratified fine sandy loam to sand.	SM, SP-SM	A-2, A-3	0	100	100	50-85	5-25	<25	NP
Hd*:											
Hanly-----------	0-6	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	<25	NP-5
	6-60	Stratified fine sandy loam to sand.	SM, SP-SM	A-2, A-3	0	100	100	50-85	5-25	<25	NP
Dogiecreek------	0-3	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	80-95	45-65	<25	NP-7
	3-41	Very fine sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4, A-6	0	100	100	80-95	40-65	15-30	5-15
	41-60	Loamy fine sand, fine sand.	SM, SM-SC	A-2	0	100	90-100	70-85	15-30	<25	NP-5
He*:											
Hanly-----------	0-5	Loamy fine sand	SM	A-2	0	100	100	50-75	15-30	<25	NP
	5-60	Stratified fine sandy loam to sand.	SM, SP-SM	A-2, A-3	0	100	100	50-85	5-25	<25	NP
Slickspots.											
Hf--------------- Harlem	0-4	Silty clay-------	CH	A-7	0	100	100	95-100	90-95	50-70	25-40
	4-27	Stratified loam to silty clay.	CH	A-7	0	100	100	95-100	80-95	50-70	25-40
	27-60	Stratified silt loam to clay.	CH	A-7	0	100	100	95-100	80-95	50-70	25-40
Hg--------------- Havre	0-5	Loam-------------	ML, CL-ML	A-4	0	100	100	85-100	70-90	20-30	NP-10
	5-60	Stratified sand to silty clay.	CL, CL-ML	A-4, A-6	0	100	100	80-95	50-70	25-35	5-15
Hh*:											
Havre-----------	0-5	Loam-------------	ML, CL-ML	A-4	0	100	100	85-100	70-90	20-30	NP-10
	5-60	Stratified sand to silty clay.	CL, CL-ML	A-4, A-6	0	100	100	80-95	50-70	25-35	5-15
Harlem----------	0-4	Silty clay-------	CH	A-7	0	100	100	95-100	70-95	60-70	30-40
	4-27	Stratified loam to silty clay.	CL, CH	A-7	0	100	100	95-100	80-95	40-60	15-30
	27-60	Stratified silt loam to clay.	CH	A-7	0	100	100	95-100	80-95	50-70	25-40
Hk--------------- Heil	0-1	Silt loam--------	CL	A-6, A-7	0	100	100	90-100	70-95	25-50	10-25
	1-18	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	50-70	25-45
	18-60	Silty clay, clay loam, loam.	CH, CL	A-7, A-6	0	100	100	85-100	60-95	25-60	11-45
HsB*:											
Hisle-----------	0-1	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	1-34	Clay, silty clay	CH	A-7	0	95-100	90-100	85-100	80-100	55-85	30-55
	34-60	Weathered bedrock	CH	A-7	0	100	95-100	95-100	85-100	50-90	30-60
Slickspots.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
KcF*:											
Kirby----------	0-7	Channery sandy loam.	SM, SM-SC	A-1, A-2	0-10	65-85	55-75	35-55	20-35	15-25	NP-10
	7-14	Extremely channery loam, extremely channery sandy loam, very channery loam.	GP-GM, GM, GM-GC	A-2, A-1	10-30	20-60	10-50	5-40	5-35	15-25	NP-10
	14-60	Fragmental material.	GP	A-1	40-60	5-15	0-10	0-5	0	<20	NP
Cabbart---------	0-4	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	65-85	20-35	5-20
	4-11	Loam-------------	CL-ML, CL	A-4, A-6	0	90-100	90-100	85-95	65-85	20-35	5-15
	11-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Ke--------------- Korchea	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	75-95	50-70	15-30	5-15
	7-60	Stratified fine sandy loam to silty clay loam.	SM-SC, CL-ML, CL, SC	A-4, A-6, A-7	0	100	100	70-100	40-95	20-50	5-20
Kg--------------- Korchea	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	75-95	50-70	15-30	5-15
	7-60	Stratified fine sandy loam to silty clay loam.	SM-SC, CL-ML, CL, SC	A-4, A-6, A-7	0	100	100	70-100	40-80	20-50	5-20
Km*:											
Korchea---------	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	75-95	50-70	15-30	5-15
	7-60	Stratified fine sandy loam to silty clay loam.	SM-SC, CL-ML, CL, SC	A-4, A-6, A-7	0	100	100	70-100	40-95	20-50	5-20
Archin----------	0-4	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	40-60	20-30	NP-7
	4-6	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	90-100	40-70	<30	NP-10
	6-17	Loam, clay loam, sandy clay loam.	CL, SC, CH	A-6, A-7	0	100	100	90-100	45-80	35-65	15-40
	17-28	Loam, sandy clay loam, fine sandy loam.	SC, CL	A-6, A-7	0	100	100	90-100	45-90	30-50	10-25
	28-60	Loam, fine sandy loam.	CL, SC	A-4, A-6, A-7	0	95-100	95-100	90-100	40-70	25-45	8-20
KoA-------------- Kremlin	0-6	Loam-------------	CL-ML	A-4	0	95-100	90-100	75-95	50-75	25-30	5-10
	6-20	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	75-95	55-80	25-35	5-15
	20-38	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	75-95	55-80	25-35	5-15
	38-60	Stratified sandy loam to silt loam.	ML, CL-ML	A-4	0	90-100	85-100	70-90	50-75	20-30	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
KrA*:											
Kremlin	0-6	Loam	CL-ML	A-4	0	95-100	90-100	75-95	50-75	25-30	5-10
	6-20	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	75-95	55-80	25-35	5-15
	20-38	Loam, silt loam, clay loam.	CL-ML, CL	A-4, A-6	0	95-100	90-100	75-95	55-80	25-35	5-15
	38-60	Stratified sandy loam to silt loam.	ML, CL-ML	A-4	0	90-100	85-100	70-90	50-75	20-30	NP-10
Archin	0-4	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	40-60	20-30	NP-7
	4-6	Loam, very fine sandy loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	90-100	40-70	<30	NP-10
	6-17	Loam, clay loam, sandy clay loam.	CL, SC, CH	A-6, A-7	0	100	100	90-100	45-80	35-65	15-40
	17-28	Loam, sandy clay loam, fine sandy loam.	SC, CL	A-6, A-7	0	100	100	90-100	45-90	30-50	10-25
	28-60	Loam, fine sandy loam.	CL, SC	A-4, A-6, A-7	0	95-100	95-100	90-100	40-70	25-45	8-20
KyB: Kyle	0-5	Clay	CH, MH	A-7	0	100	100	90-100	80-100	55-75	25-45
	5-20	Clay	CH, MH	A-7	0	100	100	90-100	80-100	55-75	25-45
	20-60	Clay	CH, MH	A-7	0	100	100	90-100	80-100	60-90	25-55
Le: Lallie	0-5	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	85-100	25-95	10-60
	5-60	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	85-100	40-95	20-60
LhD*:											
Lismas	0-3	Clay	CH, MH	A-7	0	100	100	95-100	80-100	60-90	30-50
	3-15	Clay	CH, MH	A-7	0	90-100	75-100	70-100	60-100	60-90	30-50
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Hisle	0-1	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	1-34	Clay, silty clay	CH	A-7	0	95-100	90-100	85-100	80-100	55-85	30-55
	34-60	Weathered bedrock	CH	A-7	0	100	95-100	95-100	85-100	50-90	30-60
LkD*:											
Lismas	0-3	Clay	CH, MH	A-7	0	100	100	95-100	80-100	60-90	30-50
	3-15	Clay	CH, MH	A-7	0	90-100	75-100	70-100	60-100	60-90	30-50
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Winler	0-3	Clay	CH, MH	A-7	0	100	100	90-100	80-100	65-95	30-55
	3-16	Clay	CH, MH	A-7	0	100	100	90-100	80-100	65-90	30-55
	16-25	Clay	CH, MH	A-7	0	95-100	70-100	60-100	50-100	65-90	30-55
	25-60	Weathered bedrock	CH, MH	A-7	0	100	100	90-100	80-100	65-90	30-55
LrF*:											
Lismas	0-3	Clay	CH, MH	A-7	0	100	100	95-100	80-100	60-90	30-50
	3-15	Clay	CH, MH	A-7	0	90-100	75-100	70-100	60-100	60-90	30-50
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
MaB-------------- Marmarth	0-7	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	70-85	40-55	15-25	NP-5
	7-20	Clay loam, loam, sandy clay loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	3-20
	20-35	Loam, fine sandy loam, clay loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	15-40	3-20
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
McC*: Marmarth--------	0-7	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	70-85	40-55	15-25	NP-5
	7-20	Clay loam, loam, sandy clay loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	3-20
	20-35	Loam, fine sandy loam, clay loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	15-40	3-20
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cabbart---------	0-4	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	65-85	20-35	5-20
	4-11	Loam-------------	CL-ML, CL	A-4, A-6	0	90-100	90-100	85-95	65-85	20-35	5-15
	11-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
MpB*: Marmarth--------	0-7	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	70-85	40-55	15-25	NP-5
	7-20	Clay loam, loam, sandy clay loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	3-20
	20-35	Loam, fine sandy loam, clay loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	15-40	3-20
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Parchin---------	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	35-60	20-30	NP-7
	5-10	Fine sandy loam, loamy fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	90-100	30-60	<30	NP-7
	10-18	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	18-34	Clay loam, loam, sandy clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	40-60	30-50	10-30
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
MtC*, MtD*: Marmarth--------	0-7	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	70-85	40-55	15-25	NP-5
	7-20	Clay loam, loam, sandy clay loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	3-20
	20-35	Loam, fine sandy loam, clay loam.	ML, CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	15-40	3-20
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Twilight--------	0-4	Fine sandy loam	SM, SM-SC	A-4	0	100	100	75-90	35-50	20-30	NP-7
	4-12	Fine sandy loam, sandy loam.	SM, SM-SC	A-4	0	100	100	75-90	35-50	20-30	NP-7
	12-30	Fine sandy loam, sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	60-90	25-50	<30	NP-5
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
NaD*:											
Nihill Variant--	0-3	Very gravelly loam.	SC, CL, GC	A-4, A-6, A-2	0-5	60-90	40-75	35-60	30-55	30-40	8-15
	3-18	Very gravelly loam, very gravelly sandy loam.	SM-SC, SC, GC, GM-GC	A-4, A-6, A-2	0-10	50-80	35-55	30-50	25-45	25-40	5-15
	18-30	Fine sand--------	SM, SM-SC	A-2	0-5	90-100	85-95	60-75	20-35	<25	NP-5
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Attewan---------	0-5	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-95	60-70	25-35	5-15
	5-20	Loam, clay loam	CL	A-6	0-5	95-100	95-100	75-95	60-85	30-40	10-20
	20-32	Loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	85-95	60-85	25-35	5-15
	32-60	Gravelly loamy fine sand, very gravelly loamy sand.	SM, GM	A-1	5-10	30-65	30-60	10-30	10-20	---	NP
PbB*:											
Parchin---------	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	35-60	20-30	NP-7
	5-10	Fine sandy loam, loamy fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	90-100	30-60	<30	NP-7
	10-18	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	18-34	Fine sandy loam, clay loam, sandy clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	40-60	30-50	10-30
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Bullock---------	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	40-65	25-35	NP-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-4, A-6, A-7	0	100	100	90-100	40-70	30-45	8-20
	9-20	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-70	30-50	10-30
	20-29	Sandy loam, very fine sandy loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
PhA-------------- Parshall	0-8	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	60-85	30-55	15-35	NP-7
	8-60	Fine sandy loam, sandy loam, loamy sand.	SM, ML	A-4, A-2	0	100	100	60-100	30-55	15-35	NP-7
Pt*. Pits											
RbB-------------- Reeder	0-6	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	6-30	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RcC*:											
Reeder----------	0-6	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	6-30	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cabba-----------	0-2	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	70-90	60-85	20-35	5-15
	2-15	Loam, silt loam, gravelly loam.	CL-ML, CL	A-4, A-6	0-5	90-100	90-100	70-90	60-85	20-35	5-20
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
ReB*:											
Reeder----------	0-6	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	6-30	Clay loam, loam, sandy clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rhoades---------	0-2	Loam-------------	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	2-15	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-32	Silty clay, clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
RfE*:											
Reva------------	0-3	Gravelly very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	5-10	80-100	65-80	50-75	35-60	<25	NP-7
	3-16	Very gravelly very fine sandy loam, very gravelly sandy loam, very gravelly fine sandy loam.	SM, GM	A-2, A-4	10-40	45-75	30-55	25-50	25-45	25-35	3-10
	16-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Slimbutte-------	0-5	Very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0-5	95-100	75-100	80-95	50-70	25-40	5-15
	5-12	Gravelly loam, very gravelly very fine sandy loam, gravelly very fine sandy loam.	SM, SC, GM, GC	A-2, A-4, A-6	10-30	50-90	45-60	35-50	25-45	25-40	3-15
	12-31	Gravelly loam, gravelly very fine sandy loam, very gravelly very fine sandy loam.	SM, SC, GM, GC	A-2, A-4, A-6	15-50	45-75	35-55	30-50	25-40	25-40	3-15
	31-43	Very cobbly sandy loam, very cobbly fine sandy loam, very cobbly loam.	SM, GM	A-1, A-2	30-55	40-70	35-60	25-45	15-35	25-35	3-10
	43-60	Flaggy fine sandy loam, cobbly loam, fragmental material.	SM, SM-SC	A-4	60-85	75-95	60-90	50-70	35-50	<25	NP-7

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
RgE*:											
Reva	0-3	Gravelly very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	5-10	80-100	65-80	50-75	35-60	<25	NP-7
	3-16	Very gravelly very fine sandy loam, very gravelly sandy loam, very gravelly fine sandy loam.	SM, GM	A-2, A-4	10-40	45-75	30-55	25-50	25-45	25-35	3-10
	16-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
RhB: Rhame	0-5	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	15-25	NP-5
	5-14	Fine sandy loam, sandy loam.	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	15-25	NP-5
	14-28	Fine sandy loam, sandy loam.	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	15-25	NP-5
	28-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
RmB*:											
Rhame	0-5	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	15-25	NP-5
	5-22	Fine sandy loam, sandy loam.	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	15-25	NP-5
	22-30	Fine sandy loam, sandy loam.	SM, ML, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	15-25	NP-5
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Parchin	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	35-60	20-30	NP-7
	5-10	Fine sandy loam, loamy fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	90-100	30-60	<30	NP-7
	10-18	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	18-34	Fine sandy loam, loam, sandy clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	40-60	30-50	10-30
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
RnA*:											
Rhoades	0-2	Loam	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	2-28	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	28-60	Silty clay, clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RnA*:											
Daglum----------	0-8	Loam-------------	SM, ML, CL-ML, SM-SC	A-4	0	100	100	75-90	45-65	20-30	3-10
	8-38	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-75	15-45
	38-60	Clay, silty clay, clay loam.	CL	A-7	0	100	100	90-100	65-95	40-50	20-30
RnB*:											
Rhoades---------	0-2	Loam-------------	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	2-15	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-32	Silty clay, clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Daglum----------	0-8	Loam-------------	SM, ML, CL-ML, SM-SC	A-4	0	100	100	75-90	45-65	20-30	3-10
	8-19	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-75	15-45
	19-39	Clay, silty clay, clay loam.	CL	A-7	0	100	100	90-100	65-95	40-50	20-30
	39-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
RoF*. Rock outcrop											
RrF*: Rock outcrop.											
Reva------------	0-3	Gravelly very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	5-10	80-100	65-80	50-75	35-60	<25	NP-7
	3-16	Very gravelly very fine sandy loam, very gravelly sandy loam, very gravelly fine sandy loam.	SM, GM	A-2, A-4	10-40	45-75	30-55	25-50	25-45	25-35	3-10
	16-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RsF*:											
Rockoa----------	0-5	Loam-------------	ML, CL, SM, SC	A-4, A-6	20-50	80-100	70-90	65-85	40-65	30-40	5-15
	5-21	Very channery loam, very channery clay loam.	SC, SM, CL, ML	A-4, A-6	30-60	70-100	65-90	60-85	35-60	30-40	5-15
	21-60	Very channery loam.	SM, SC, SM-SC, GM	A-4, A-6	30-70	70-100	65-85	55-75	35-50	20-35	3-12

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RsF*:											
Reva	0-3	Gravelly very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	5-10	80-100	65-80	50-75	35-60	<25	NP-7
	3-16	Very gravelly very fine sandy loam, very gravelly sandy loam, very gravelly fine sandy loam.	SM, GM	A-2, A-4	10-40	45-75	30-55	25-50	25-45	25-35	3-10
	16-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SaA Sage	0-5	Loam	CL	A-6	0	100	95-100	85-95	55-80	30-40	10-20
	5-40	Silty clay, clay, silty clay loam.	CH, MH	A-7	0	100	95-100	90-100	80-100	50-80	20-45
	40-50	Clay, silty clay	CH	A-7	0-5	95-100	85-100	80-95	70-95	50-80	25-45
	50-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
SbA*:											
Sage	0-5	Silty clay loam	CL, CH	A-7	0	100	95-100	95-100	90-100	40-60	15-30
	5-40	Silty clay, clay, silty clay loam.	CH, MH	A-7	0	100	95-100	90-100	80-100	50-80	20-45
	40-50	Clay, silty clay	CH	A-7	0-5	95-100	85-100	80-95	70-95	50-80	25-45
	50-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Hisle Variant	0-1	Silt loam	ML, CL-ML, CL	A-4, A-6	0	100	100	75-100	65-95	30-40	5-15
	1-13	Silty clay, clay	CH, MH	A-7	0	100	100	90-100	85-100	50-70	20-40
	13-38	Silty clay, clay	CH, MH	A-7	0	70-100	60-100	85-100	85-95	50-70	20-40
	38-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
SgA Savage	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	15-30
	6-23	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-70	20-45
	23-38	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-70	20-45
	38-60	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-70	20-45
ShB Shambo	0-5	Loam	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-35	3-13
	5-15	Loam, silt loam, clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-40	3-18
	15-60	Stratified loam to silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-40	3-18
SmB*:											
Shambo	0-5	Loam	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-35	3-13
	5-15	Loam, silt loam, clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-40	3-18
	15-60	Stratified loam to silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	25-40	3-18

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SmB*:											
Rhoades	0-2	Loam	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	2-28	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	28-60	Silty clay, clay loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
Sn*. Slickspots											
SpC*:											
Slimbutte	0-5	Very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0-5	95-100	75-100	80-95	50-70	25-40	5-15
	5-12	Gravelly loam, very gravelly very fine sandy loam, gravelly very fine sandy loam.	SM, SC, GM, GC	A-2, A-4, A-6	10-30	50-90	45-60	35-50	25-45	25-40	3-15
	12-31	Gravelly loam, gravelly very fine sandy loam, very gravelly very fine sandy loam.	SM, SC, GM, GC	A-2, A-4, A-6	15-50	45-75	35-55	30-50	25-40	25-40	3-15
	31-43	Very cobbly sandy loam, very cobbly fine sandy loam, very cobbly loam.	SM, GM	A-1, A-2	30-55	40-70	35-60	25-45	15-35	25-35	3-10
	43-60	Flaggy fine sandy loam, cobbly loam, fragmental material.	SM, SM-SC	A-4	60-85	75-95	60-90	50-70	35-50	<25	NP-7
Arnegard	0-11	Loam	CL-ML, CL	A-4, A-6	0	100	100	85-100	60-90	20-35	5-20
	11-32	Loam, silt loam, clay loam.	CL	A-6	0	100	100	85-100	50-90	25-40	12-25
	32-60	Loam, clay loam, loamy fine sand.	SM, ML, CL, SC	A-4, A-6	0	100	100	70-100	40-80	15-40	NP-15
Reva	0-9	Gravelly very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	5-10	80-100	65-80	50-75	35-60	<25	NP-7
	9-23	Very gravelly very fine sandy loam, very gravelly sandy loam, very gravelly fine sandy loam.	SM, GM	A-2, A-4	10-40	45-75	30-55	25-50	25-45	25-35	3-10
	23-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
SrE*:											
Slimbutte-------	0-5	Very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0-5	95-100	75-100	80-95	50-70	25-40	5-15
	5-12	Gravelly loam, very gravelly very fine sandy loam, gravelly very fine sandy loam.	SM, SC, GM, GC	A-2, A-4, A-6	10-30	50-90	45-60	35-50	25-45	25-40	3-15
	12-31	Gravelly loam, gravelly very fine sandy loam, very gravelly very fine sandy loam.	SM, SC, GM, GC	A-2, A-4, A-6	15-50	45-75	35-55	30-50	25-40	25-40	3-15
	31-43	Very cobbly sandy loam, very cobbly fine sandy loam, very cobbly loam.	SM, GM	A-1, A-2	30-55	40-70	35-60	25-45	15-35	25-35	3-10
	43-60	Flaggy fine sandy loam, cobbly loam, fragmental material.	SM, SM-SC	A-4	60-85	75-95	60-90	50-70	35-50	<25	NP-7
Reva------------	0-3	Gravelly very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	5-10	80-100	65-80	50-75	35-60	<25	NP-7
	3-16	Very gravelly very fine sandy loam, very gravelly sandy loam, very gravelly fine sandy loam.	SM, GM	A-2, A-4	10-40	45-75	30-55	25-50	25-45	25-35	3-10
	16-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SwA-------------- Swanboy	0-2	Clay-------------	CH, MH	A-7	0	100	100	90-100	75-95	60-90	30-55
	2-60	Clay-------------	CH, MH	A-7	0	100	100	90-100	75-95	65-90	30-55
SyA*:											
Swanboy---------	0-2	Clay-------------	CH, MH	A-7	0	100	100	90-100	75-95	60-90	30-55
	2-60	Clay-------------	CH, MH	A-7	0	100	100	90-100	75-95	65-90	30-55
Slickspots.											
TnB-------------- Tanna	0-9	Silty clay loam	CL	A-6	0-5	90-100	90-100	90-100	85-95	35-40	15-20
	9-36	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0-5	90-100	90-100	80-95	75-90	35-45	15-25
	36-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
ToA*:											
Tanna-----------	0-9	Silty clay loam	CL	A-6	0-5	90-100	90-100	90-100	85-95	35-40	15-20
	9-36	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0-5	90-100	90-100	80-95	75-90	35-45	15-25
	36-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ToA*:											
Gerdrum---------	0-2	Silt loam--------	CL-ML	A-4	0	80-100	75-100	60-90	50-80	25-30	5-10
	2-36	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	90-100	90-100	85-100	75-95	40-60	20-40
	36-60	Clay loam, sandy clay loam, clay.	CL, SC, CH	A-6, A-7	0	90-100	90-100	80-95	45-75	35-55	15-35
ToC*:											
Tanna-----------	0-9	Silty clay loam	CL	A-6	0-5	90-100	90-100	90-100	85-95	35-40	15-20
	9-36	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0-5	90-100	90-100	80-95	75-90	35-45	15-25
	36-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rhoades---------	0-2	Loam-------------	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	2-15	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	15-32	Silty clay, clay loam, loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
TrB------------- Trey	0-4	Loamy fine sand	SM, SM-SC	A-2	0	100	100	55-85	15-35	<25	NP-5
	4-30	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-30	<25	NP
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
TtC*:											
Trey------------	0-5	Loamy fine sand	SM, SM-SC	A-2	0	100	100	55-85	15-35	<25	NP-5
	5-16	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-30	<25	NP
	16-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Fleak-----------	0-3	Loamy fine sand	SM	A-2, A-4	0-5	95-100	95-100	45-80	20-40	---	NP
	3-16	Fine sand, loamy fine sand.	SM	A-2, A-4	0-5	95-100	95-100	40-85	20-40	---	NP
	16-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
TvB*:											
Trey------------	0-4	Loamy fine sand	SM, SM-SC	A-2	0	100	100	55-85	15-35	<25	NP-5
	4-30	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-30	<25	NP
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
Parchin---------	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	35-60	20-30	NP-7
	5-10	Fine sandy loam, loamy fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	90-100	30-60	<30	NP-7
	10-18	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	18-34	Fine sandy loam, clay loam, sandy clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	40-60	30-50	10-30
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
TvB*:											
Bullock	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	40-65	25-35	NP-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-4, A-6, A-7	0	100	100	90-100	40-70	30-45	8-20
	9-20	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-70	30-50	10-30
	20-29	Sandy loam, very fine sandy loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	29-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
TwC Twilight	0-4	Fine sandy loam	SM, SM-SC	A-4	0	100	100	75-90	35-50	20-30	NP-7
	4-12	Fine sandy loam, sandy loam.	SM, SM-SC	A-4	0	100	100	75-90	35-50	20-30	NP-7
	12-30	Fine sandy loam, sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	60-90	25-50	<30	NP-5
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
TxE*:											
Twilight	0-4	Fine sandy loam	SM, SM-SC	A-4	0	100	100	75-90	35-50	20-30	NP-7
	4-12	Fine sandy loam, sandy loam.	SM, SM-SC	A-4	0	100	100	75-90	35-50	20-30	NP-7
	12-30	Fine sandy loam, sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	60-90	25-50	<30	NP-5
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Blackhall	0-4	Fine sandy loam	CL-ML	A-4	0-5	90-100	90-100	65-85	60-70	15-20	5-10
	4-18	Sandy loam, fine sandy loam, very fine sandy loam.	SM	A-2, A-4	0-5	90-100	85-100	55-90	30-50	15-20	NP-5
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
TyC*:											
Twilight	0-4	Fine sandy loam	SM, SM-SC	A-4	0	100	100	75-90	35-50	20-30	NP-7
	4-12	Fine sandy loam, sandy loam.	SM, SM-SC	A-4	0	100	100	75-90	35-50	20-30	NP-7
	12-30	Fine sandy loam, sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	60-90	25-50	<30	NP-5
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Parchin	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	35-60	20-30	NP-7
	5-10	Fine sandy loam, loamy fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	90-100	30-60	<30	NP-7
	10-18	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	18-34	Fine sandy loam, loam, sandy clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	40-60	30-50	10-30
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
TzA Twotop	0-4	Clay	CH, MH	A-7	0	100	95-100	85-100	75-100	60-85	30-45
	4-60	Clay, silty clay	CH, MH	A-7	0	100	95-100	95-100	85-100	60-85	30-45

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
VaF*:											
Vanocker--------	0-2	Gravelly loam----	ML, CL, SM, SC	A-4, A-6, A-7	0-10	60-80	55-75	50-70	45-70	30-45	7-20
	2-12	Gravelly loam, very gravelly clay loam, very channery clay loam.	CL, SC, GC	A-6, A-7	5-15	60-80	50-70	45-65	40-60	30-45	10-20
	12-30	Gravelly loam, very gravelly loam, very channery silt loam.	CL, GC, ML, GM	A-6, A-4	5-25	50-70	40-60	40-55	35-55	30-40	7-15
	30-60	Very gravelly silt loam, very gravelly loam, very cobbly loam.	CL, GC, ML, GM	A-4, A-6	5-25	50-65	40-60	40-55	35-55	30-40	7-15
Reva------------	0-3	Gravelly very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	5-10	80-100	65-80	50-75	35-60	<25	NP-7
	3-16	Very gravelly very fine sandy loam, very gravelly sandy loam, very gravelly fine sandy loam.	SM, GM	A-2, A-4	10-40	45-75	30-55	25-50	25-45	25-35	3-10
	16-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
VbB-------------- Vebar	0-20	Fine sandy loam	SM, ML	A-4, A-2	0	95-100	90-100	60-100	30-55	---	NP
	20-32	Fine sandy loam, loamy fine sand, sandy loam.	SM, ML	A-4, A-2	0	95-100	90-100	60-100	30-55	---	NP
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
VcC*, VcD*:											
Vebar-----------	0-20	Fine sandy loam	SM, ML	A-4, A-2	0	95-100	90-100	60-100	30-55	---	NP
	20-32	Fine sandy loam, loamy fine sand, sandy loam.	SM, ML	A-4, A-2	0	95-100	90-100	60-100	30-55	---	NP
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cohagen---------	0-16	Fine sandy loam	SM	A-2, A-4	0	100	95-100	60-85	30-50	---	NP
	16-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
WaB*:											
Watrous---------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-40	5-20
	8-30	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	80-100	60-80	25-45	10-30
	30-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Werner----------	0-6	Loam-------------	CL-ML, CL, SM-SC, SC	A-4, A-6	0-5	90-100	85-100	80-95	35-90	25-40	5-20
	6-13	Loam, very fine sandy loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	80-95	50-90	25-50	5-25
	13-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
WbB*:											
Watrous	0-8	Loam	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-40	5-20
	8-30	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	80-100	60-80	25-45	10-30
	30-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rhoades	0-1	Loam	SM, ML, SC, CL	A-4, A-6	0	100	100	75-90	45-65	20-35	NP-15
	1-18	Clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	80-95	40-75	20-45
	18-27	Silty clay, clay loam, loam.	CL, CH	A-6, A-7	0	100	100	85-100	75-95	35-70	20-40
	27-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
WdC*:											
Werner	0-6	Loam	CL-ML, CL, SM-SC, SC	A-4, A-6	0-5	90-100	85-100	80-95	35-90	25-40	5-20
	6-13	Loam, very fine sandy loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	80-95	50-90	25-50	5-25
	13-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Reva	0-3	Gravelly very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	5-10	80-100	65-80	50-75	35-60	<25	NP-7
	3-16	Very gravelly very fine sandy loam, very gravelly sandy loam, very gravelly fine sandy loam.	SM, GM	A-2, A-4	10-40	45-75	30-55	25-50	25-45	25-35	3-10
	16-24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WeC*:											
Werner	0-6	Loam	CL-ML, CL, SM-SC, SC	A-4, A-6	0-5	90-100	85-100	80-95	35-90	25-40	5-20
	6-13	Loam, very fine sandy loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	80-95	50-90	25-50	5-25
	13-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Watrous	0-8	Loam	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-40	5-20
	8-30	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	80-100	60-80	25-45	10-30
	30-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WhB*:											
Winler	0-3	Clay	CH, MH	A-7	0	100	100	90-100	80-100	65-95	30-55
	3-16	Clay	CH, MH	A-7	0	100	100	90-100	80-100	65-90	30-55
	16-25	Clay	CH, MH	A-7	0	95-100	70-100	60-100	50-100	65-90	30-55
	25-60	Weathered bedrock	CH, MH	A-7	0	100	100	90-100	80-100	65-90	30-55
Hisle	0-1	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	1-34	Clay, silty clay	CH	A-7	0	95-100	90-100	85-100	80-100	45-85	20-55
	34-60	Weathered bedrock	CH	A-7	0	100	95-100	95-100	85-100	50-90	30-60

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WsC*:											
Winler----------	0-3	Clay-------------	CH, MH	A-7	0	100	100	90-100	80-100	65-95	30-55
	3-16	Clay-------------	CH, MH	A-7	0	100	100	90-100	80-100	65-90	30-55
	16-25	Clay-------------	CH, MH	A-7	0	95-100	70-100	60-100	50-100	65-90	30-55
	25-60	Weathered bedrock	CH, MH	A-7	0	100	100	90-100	80-100	65-90	30-55
Lismas----------	0-3	Clay-------------	CH, MH	A-7	0	100	100	95-100	80-100	60-90	30-50
	3-15	Clay-------------	CH, MH	A-7	0	90-100	75-100	70-100	60-100	60-90	30-50
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
ZaB, ZaD--------- Zeona	0-3	Loamy fine sand	SM, SP-SM, SM-SC	A-2	0	100	100	80-100	10-35	<25	NP-5
	3-60	Loamy fine sand, fine sand.	SM, SP-SM, SM-SC	A-2	0	100	100	75-95	10-35	<25	NP-5
ZbC*:											
Zeona-----------	0-3	Loamy fine sand	SM, SP-SM, SM-SC	A-2	0	100	100	80-100	10-35	<25	NP-5
	3-60	Loamy fine sand, fine sand.	SM, SP-SM, SM-SC	A-2	0	100	100	75-95	10-35	<25	NP-5
Blownout land.											
ZpB*:											
Zeona-----------	0-3	Loamy fine sand	SM, SP-SM, SM-SC	A-2	0	100	100	80-100	10-35	<25	NP-5
	3-60	Loamy fine sand, fine sand.	SM, SP-SM, SM-SC	A-2	0	100	100	75-95	10-35	<25	NP-5
Parchin---------	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	35-60	20-30	NP-7
	5-10	Fine sandy loam, loamy fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	100	100	90-100	30-60	<30	NP-7
	10-18	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	35-60	30-50	10-30
	18-34	Fine sandy loam, loam, sandy clay loam.	SC, CL	A-6, A-7	0	100	95-100	90-100	40-60	30-50	10-30
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
AaA, AaB: Amor	0-8	15-25	1.00-1.40	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-6
	8-34	18-30	1.20-1.60	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	34-60	---	---	---	---	---	---	----------	----			
AcC*:												
Amor	0-8	15-25	1.00-1.40	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-6
	8-34	18-30	1.20-1.60	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	34-60	---	---	---	---	---	---	----------	----			
Cabba	0-2	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	<2	Low	0.32	2	4L	.5-1
	2-15	20-27	1.25-1.35	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low	0.32			
	15-60	---	---	---	---	---	---	----------	----			
AdC*:												
Amor	0-8	15-25	1.00-1.40	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-6
	8-34	18-30	1.20-1.60	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	34-60	---	---	---	---	---	---	----------	----			
Rhoades	0-2	10-27	1.10-1.30	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low	0.32	3	6	2-6
	2-15	35-50	1.20-1.50	<0.2	0.10-0.12	>6.5	2-16	High	0.32			
	15-32	20-45	1.20-1.50	<0.2	0.10-0.12	>7.3	8-16	High	0.32			
	32-60	---	---	---	---	---	---	----------	----			
AeB*:												
Amor	0-8	15-25	1.00-1.40	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-6
	8-34	18-30	1.20-1.60	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	34-60	---	---	---	---	---	---	----------	----			
Werner	0-6	14-27	1.20-1.40	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.28	2	6	2-4
	6-13	14-35	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Moderate	0.28			
	13-60	---	---	---	---	---	---	----------	----			
AkA*:												
Archin	0-4	5-15	1.35-1.65	2.0-6.0	0.14-0.17	5.6-7.3	<2	Low	0.24	3	3	1-3
	4-6	7-20	1.35-1.60	0.6-2.0	0.12-0.17	5.6-7.3	<2	Low	0.24			
	6-17	20-35	1.35-1.65	<0.2	0.13-0.15	5.6-7.8	2-4	Moderate	0.37			
	17-28	10-30	1.35-1.65	<0.2	0.10-0.15	7.4-9.0	2-8	Moderate	0.37			
	28-60	10-25	1.40-1.60	0.2-2.0	0.09-0.15	7.4-9.0	2-8	Low	0.37			
Bullock	0-4	5-10	1.35-1.60	2.0-6.0	0.12-0.17	6.1-7.8	<2	Low	0.28	3	3	1-2
	4-9	18-35	1.50-1.80	<0.2	0.13-0.17	6.6-8.4	<4	Moderate	0.37			
	9-20	18-35	1.45-1.70	<0.06	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	20-60	10-35	1.40-1.60	0.06-2.0	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
Ar: Arnegard	0-9	15-25	1.00-1.40	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	0.28	5	6	3-6
	9-23	18-30	1.20-1.60	0.6-2.0	0.17-0.21	6.1-7.8	<2	Moderate	0.28			
	23-60	5-30	1.20-1.60	0.6-2.0	0.13-0.19	6.6-8.4	<2	Low	0.28			
AsA, AsB: Assinniboine	0-8	5-15	1.30-1.40	2.0-6.0	0.11-0.17	6.6-7.8	<2	Low	0.24	5	3	2-3
	8-18	20-27	1.25-1.35	0.6-2.0	0.12-0.18	6.6-7.8	<2	Low	0.32			
	18-43	15-27	1.25-1.40	2.0-6.0	0.09-0.18	7.4-8.4	<2	Low	0.24			
	43-60	10-20	1.30-1.45	2.0-6.0	0.08-0.15	7.4-8.4	<2	Low	0.24			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
AtA*:												
Assinniboine----	0-8	5-15	1.30-1.40	2.0-6.0	0.11-0.17	6.6-7.8	<2	Low-------	0.24	5	3	2-3
	8-18	20-27	1.25-1.35	0.6-2.0	0.12-0.18	6.6-7.8	<2	Low-------	0.32			
	18-43	15-27	1.25-1.40	2.0-6.0	0.09-0.18	7.4-8.4	<2	Low-------	0.24			
	43-60	10-20	1.30-1.45	2.0-6.0	0.08-0.15	7.4-8.4	<2	Low-------	0.24			
Archin----------	0-4	5-15	1.35-1.65	2.0-6.0	0.14-0.17	5.6-7.3	<2	Low-------	0.24	3	3	1-3
	4-6	7-20	1.35-1.60	0.6-2.0	0.12-0.17	5.6-7.3	<2	Low-------	0.24			
	6-17	20-35	1.35-1.65	<0.2	0.13-0.15	5.6-7.8	2-4	Moderate	0.37			
	17-28	10-30	1.35-1.65	<0.2	0.10-0.15	7.4-9.0	2-8	Moderate	0.37			
	28-60	10-25	1.40-1.60	0.2-2.0	0.09-0.15	7.4-9.0	2-8	Low-------	0.37			
AwB-------------- Attewan	0-5	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low-------	0.28	4	6	1-3
	5-20	24-35	1.30-1.40	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	0.32			
	20-32	20-27	1.20-1.35	0.6-2.0	0.16-0.18	7.4-9.0	<2	Low-------	0.32			
	32-60	5-12	1.50-1.75	>6.0	0.03-0.06	7.4-9.0	<2	Low-------	0.10			
Ba*. Badlands												
BeC-------------- Boxwell	0-7	18-27	1.15-1.25	0.6-2.0	0.18-0.20	6.6-7.3	<2	Low-------	0.28	4	6	1-3
	7-12	20-27	1.20-1.30	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low-------	0.32			
	12-31	20-27	1.15-1.30	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low-------	0.32			
	31-60	---	---	---	---	---	---	----------	----			
BkF-------------- Bullock	0-4	12-18	1.30-1.55	2.0-6.0	0.12-0.15	6.1-7.8	<2	Low-------	0.24	3	3	1-2
	4-20	25-35	1.35-1.55	0.06-0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.32			
	20-29	15-35	1.35-1.55	0.06-0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.32			
	29-60	---	---	---	---	---	---	----------	----			
BnA*:												
Bullock---------	0-4	5-10	1.35-1.60	2.0-6.0	0.12-0.17	6.1-7.8	<2	Low-------	0.28	3	3	1-2
	4-9	18-35	1.50-1.80	<0.2	0.13-0.17	6.6-8.4	<4	Moderate	0.37			
	9-20	18-35	1.45-1.70	<0.06	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	20-60	10-35	1.40-1.60	0.06-2.0	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
Assinniboine----	0-8	5-15	1.30-1.40	2.0-6.0	0.11-0.17	6.6-7.8	<2	Low-------	0.24	5	3	2-3
	8-18	20-27	1.25-1.35	0.6-2.0	0.12-0.18	6.6-7.8	<2	Low-------	0.32			
	18-43	15-27	1.25-1.40	2.0-6.0	0.09-0.18	7.4-8.4	<2	Low-------	0.24			
	43-60	10-20	1.30-1.45	2.0-6.0	0.08-0.15	7.4-8.4	<2	Low-------	0.24			
BoD*:												
Bullock---------	0-4	5-10	1.35-1.60	2.0-6.0	0.12-0.17	6.1-7.8	<2	Low-------	0.28	3	3	1-2
	4-9	18-35	1.50-1.80	<0.2	0.13-0.17	6.6-8.4	<4	Moderate	0.37			
	9-20	18-35	1.45-1.70	<0.06	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	20-29	10-35	1.40-1.60	0.06-2.0	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	29-60	---	---	---	---	---	---	----------	----			
Cabbart---------	0-4	20-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low-------	0.32	2	4L	1-2
	4-11	20-27	1.25-1.35	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low-------	0.32			
	11-60	---	---	---	---	---	---	----------	----			
BpB*:												
Bullock---------	0-4	5-10	1.35-1.60	2.0-6.0	0.12-0.17	6.1-7.8	<2	Low-------	0.28	3	3	1-2
	4-9	18-35	1.50-1.80	<0.2	0.13-0.17	6.6-8.4	<4	Moderate	0.37			
	9-20	18-35	1.45-1.70	<0.06	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	20-29	10-35	1.40-1.60	0.06-2.0	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	29-60	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
BpB*:												
Parchin	0-5	5-15	1.35-1.65	2.0-6.0	0.13-0.16	5.1-7.3	<2	Low	0.24	3	3	1-3
	5-10	5-15	1.35-1.65	2.0-6.0	0.08-0.14	5.6-7.3	<2	Low	0.24			
	10-18	20-35	1.50-1.85	<0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.37			
	18-34	15-30	1.40-1.60	0.6-2.0	0.11-0.13	7.4-9.0	2-8	Low	0.37			
	34-60	---	---	---	---	---	---	---	---			
Slickspots.												
BsA*:												
Bullock	0-4	5-10	1.35-1.60	2.0-6.0	0.12-0.17	6.1-7.8	<2	Low	0.28	3	3	1-2
	4-9	18-35	1.50-1.80	<0.2	0.13-0.17	6.6-8.4	<4	Moderate	0.37			
	9-20	18-35	1.45-1.70	<0.06	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	20-29	10-35	1.40-1.60	0.06-2.0	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	29-60	---	---	---	---	---	---	---	---			
Slickspots.												
CaD*:												
Cabba	0-2	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	<2	Low	0.32	2	4L	.5-1
	2-15	20-27	1.25-1.35	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low	0.32			
	15-60	---	---	---	---	---	---	---	---			
Lantry	0-4	18-26	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low	0.43	4	4L	1-3
	4-28	18-27	1.20-1.40	0.6-2.0	0.17-0.20	7.4-8.4	<2	Low	0.43			
	28-60	---	---	---	---	---	---	---	---			
Amor	0-8	15-25	1.00-1.40	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-6
	8-34	18-30	1.20-1.60	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	34-60	---	---	---	---	---	---	---	---			
CbD*:												
Cabba	0-2	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	<2	Low	0.32	2	4L	.5-1
	2-15	20-27	1.25-1.35	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low	0.32			
	15-60	---	---	---	---	---	---	---	---			
Reeder	0-6	10-27	1.10-1.30	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-5
	6-30	18-35	1.20-1.40	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	30-60	---	---	---	---	---	---	---	---			
CcE Cabbart	0-4	18-27	1.30-1.50	0.6-2.0	0.08-0.11	7.4-8.4	<4	Low	0.24	2	8	1-2
	4-11	15-35	1.30-1.50	0.6-2.0	0.15-0.19	7.4-8.4	2-8	Low	0.32			
	11-60	---	---	---	---	---	---	---	---			
CdE*:												
Cabbart	0-4	20-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low	0.32	2	4L	1-2
	4-11	20-27	1.25-1.35	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low	0.32			
	11-60	---	---	---	---	---	---	---	---			
Delridge	0-5	18-30	1.20-1.30	0.6-2.0	0.17-0.20	6.6-7.8	<2	Moderate	0.32	4	4L	.5-2
	5-25	18-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.32			
	25-60	---	---	---	---	---	---	---	---			
CeE*:												
Cabbart	0-4	20-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low	0.32	2	4L	1-2
	4-11	20-27	1.25-1.35	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low	0.32			
	11-60	---	---	---	---	---	---	---	---			
Rock outcrop.												

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
ChA-------------- Chinook	0-6	10-18	1.25-1.30	2.0-6.0	0.11-0.17	6.6-7.8	<2	Low--------	0.24	5	3	1-3
	6-25	10-18	1.30-1.40	2.0-6.0	0.09-0.15	6.6-7.8	<2	Low--------	0.28			
	25-60	5-18	1.35-1.55	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.28			
CnA*:												
Chinook----------	0-6	10-18	1.25-1.30	2.0-6.0	0.11-0.17	6.6-7.8	<2	Low--------	0.24	5	3	1-3
	6-25	10-18	1.30-1.40	2.0-6.0	0.09-0.15	6.6-7.8	<2	Low--------	0.28			
	25-60	5-18	1.35-1.55	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.28			
Archin-----------	0-4	5-15	1.35-1.65	2.0-6.0	0.14-0.17	5.6-7.3	<2	Low--------	0.24	3	3	1-3
	4-6	7-20	1.35-1.60	0.6-2.0	0.12-0.17	5.6-7.3	<2	Low--------	0.24			
	6-17	20-35	1.35-1.65	<0.2	0.13-0.15	5.6-7.8	2-4	Moderate	0.37			
	17-28	10-30	1.35-1.65	<0.2	0.10-0.15	7.4-9.0	2-8	Moderate	0.37			
	28-60	10-25	1.40-1.60	0.2-2.0	0.09-0.15	7.4-9.0	2-8	Low--------	0.37			
CoE-------------- Cohagen	0-16	10-18	1.20-1.60	2.0-6.0	0.13-0.18	6.6-8.4	<2	Low--------	0.24	2	3	<1
	16-60	---	---	---	---	---	---	-----------	----			
CrF*:												
Cohagen----------	0-11	10-18	1.20-1.60	2.0-6.0	0.13-0.18	6.6-8.4	<2	Low--------	0.24	2	3	<1
	11-60	---	---	---	---	---	---	-----------	----			
Rock outcrop.												
Cabba Variant---	0-3	28-35	1.20-1.30	0.6-2.0	0.17-0.20	6.6-7.8	<2	Moderate	0.32	2	7	1-2
	3-16	28-35	1.25-1.35	0.6-2.0	0.17-0.20	7.4-8.4	2-4	Moderate	0.32			
	16-24	---	---	---	---	---	---	-----------	----			
DcC*:												
Delridge---------	0-5	18-30	1.20-1.30	0.6-2.0	0.17-0.20	6.6-7.8	<2	Moderate	0.32	4	4L	.5-2
	5-25	18-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.32			
	25-60	---	---	---	---	---	---	-----------	----			
Cabbart----------	0-4	20-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.32	2	4L	1-2
	4-11	20-27	1.25-1.35	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low--------	0.32			
	11-60	---	---	---	---	---	---	-----------	----			
Du*. Dumps												
Dw*. Dune land												
EaA-------------- Eapa	0-4	20-27	1.20-1.30	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	0.28	5	6	2-4
	4-13	24-34	1.30-1.45	0.6-2.0	0.16-0.20	6.1-7.8	<2	Moderate	0.28			
	13-34	20-33	1.30-1.45	0.6-2.0	0.16-0.20	6.6-8.4	<2	Moderate	0.28			
	34-60	18-30	1.35-1.50	0.6-2.0	0.17-0.20	7.4-8.4	<4	Moderate	0.28			
EcA*:												
Eapa-------------	0-4	20-27	1.20-1.30	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	0.28	5	6	2-4
	4-13	24-34	1.30-1.45	0.6-2.0	0.16-0.20	6.1-7.8	<2	Moderate	0.28			
	13-34	20-33	1.30-1.45	0.6-2.0	0.16-0.20	6.6-8.4	<2	Moderate	0.28			
	34-60	18-30	1.35-1.50	0.6-2.0	0.17-0.20	7.4-8.4	<4	Moderate	0.28			
Archin-----------	0-4	5-15	1.35-1.65	2.0-6.0	0.14-0.17	5.6-7.3	<2	Low--------	0.24	3	3	1-3
	4-6	7-20	1.35-1.60	0.6-2.0	0.12-0.17	5.6-7.3	<2	Low--------	0.24			
	6-17	20-35	1.35-1.65	<0.2	0.13-0.15	5.6-7.8	2-4	Moderate	0.37			
	17-28	10-30	1.35-1.65	<0.2	0.10-0.15	7.4-9.0	2-8	Moderate	0.37			
	28-60	10-25	1.40-1.60	0.2-2.0	0.09-0.15	7.4-9.0	2-8	Low--------	0.37			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
FaB--------------	0-5	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	<2	Low--------	0.28	5	6	2-4
Farnuf	5-19	25-35	1.25-1.35	0.6-2.0	0.15-0.20	6.1-7.8	<2	Moderate	0.32			
	19-35	25-35	1.20-1.45	0.6-2.0	0.15-0.20	7.4-8.4	<2	Moderate	0.32			
	35-60	20-35	1.25-1.45	0.6-2.0	0.15-0.20	7.4-8.4	<2	Moderate	0.32			
FtE*:												
Fleak-----------	0-5	0-15	1.10-1.50	6.0-20	0.06-0.12	6.6-8.4	<2	Low--------	0.17	2	2	<1
	5-16	0-15	1.10-1.50	6.0-20	0.06-0.10	6.6-8.4	<2	Low--------	0.17			
	16-60	---	---	---	---	---	---	-----------	----			
Trey------------	0-4	3-15	1.35-1.50	6.0-20	0.10-0.12	6.1-7.8	<2	Low--------	0.17	4	2	.5-1
	4-30	3-15	1.45-1.60	6.0-20	0.06-0.10	6.1-7.8	<2	Low--------	0.17			
	30-60	---	---	---	---	---	---	-----------	----			
Rock outcrop.												
GdA--------------	0-2	20-27	---	0.6-2.0	0.18-0.22	6.6-7.8	<2	Low--------	0.37	5	6	1-3
Gerdrum	2-36	35-55	---	<0.06	0.10-0.13	7.4-9.0	2-8	High-------	0.20			
	36-60	30-50	---	<0.06	0.08-0.10	7.9-9.0	8-16	High-------	0.43			
Ge---------------	0-8	10-18	1.25-1.40	2.0-6.0	0.09-0.15	6.6-8.4	<2	Low--------	0.20	5	3	.5-1
Glendive	8-60	5-18	1.30-1.65	2.0-6.0	0.08-0.15	7.4-9.0	<8	Low--------	0.20			
GhB*:												
Glendive--------	0-8	10-18	1.25-1.40	2.0-6.0	0.09-0.15	6.6-8.4	<2	Low--------	0.20	5	3	.5-1
	8-60	5-18	1.30-1.65	2.0-6.0	0.08-0.15	7.4-9.0	<8	Low--------	0.20			
Archin----------	0-4	5-15	1.35-1.65	2.0-6.0	0.14-0.17	5.6-7.3	<2	Low--------	0.24	3	3	1-3
	4-6	7-20	1.35-1.60	0.6-2.0	0.12-0.17	5.6-7.3	<2	Low--------	0.24			
	6-17	20-35	1.35-1.65	<0.2	0.13-0.15	5.6-7.8	2-4	Moderate	0.37			
	17-28	10-30	1.35-1.65	<0.2	0.10-0.15	7.4-9.0	2-8	Moderate	0.37			
	28-60	10-25	1.40-1.60	0.2-2.0	0.09-0.15	7.4-9.0	2-8	Low--------	0.37			
GkA--------------	0-6	15-27	1.10-1.40	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7	4-6
Grail	6-27	35-45	1.20-1.60	0.2-0.6	0.13-0.18	6.6-7.3	<2	High-------	0.32			
	27-60	18-45	1.20-1.70	0.2-0.6	0.14-0.22	7.4-8.4	<2	Moderate	0.32			
GrA*:												
Grail-----------	0-6	15-27	1.10-1.40	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7	4-6
	6-27	35-45	1.20-1.60	0.2-0.6	0.13-0.18	6.6-7.3	<2	High-------	0.32			
	27-60	18-45	1.20-1.70	0.2-0.6	0.14-0.22	7.4-8.4	<2	Moderate	0.32			
Daglum----------	0-8	10-25	1.20-1.50	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low--------	0.32	3	6	2-4
	8-19	35-50	1.30-1.60	<0.06	0.12-0.14	6.1-9.0	2-8	High-------	0.32			
	19-60	35-50	1.50-1.70	<0.06	0.12-0.14	7.9-9.0	8-16	High-------	0.32			
Ha---------------	0-6	10-20	1.10-1.50	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low--------	0.20	5	3	<1
Hanly	6-60	0-12	1.20-1.60	6.0-20	0.05-0.14	6.6-8.4	<2	Low--------	0.17			
Hb---------------	0-5	0-10	1.10-1.50	6.0-20	0.08-0.12	6.6-8.4	<2	Low--------	0.17	5	2	<1
Hanly	5-60	0-12	1.20-1.60	6.0-20	0.05-0.14	6.6-8.4	<2	Low--------	0.17			
Hd*:												
Hanly-----------	0-6	10-20	1.10-1.50	2.0-6.0	0.13-0.15	6.6-8.4	<2	Low--------	0.20	5	3	<1
	6-60	0-12	1.20-1.60	6.0-20	0.05-0.14	6.6-8.4	<2	Low--------	0.17			
Dogiecreek------	0-3	5-18	1.30-1.40	2.0-6.0	0.09-0.14	7.4-9.0	>8	Low--------	0.24	5	3	.5-1
	3-41	10-18	1.30-1.50	0.6-2.0	0.10-0.15	>8.4	>8	Low--------	0.32			
	41-60	3-10	1.45-1.65	6.0-20	0.04-0.08	>7.8	>8	Low--------	0.17			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
He*:												
Hanly-----------	0-5	0-10	1.10-1.50	6.0-20	0.08-0.12	6.6-8.4	<2	Low--------	0.17	5	2	<1
	5-60	0-12	1.20-1.60	6.0-20	0.05-0.14	6.6-8.4	<2	Low--------	0.17			
Slickspots.												
Hf---------------- Harlem	0-4	35-50	1.25-1.35	0.06-0.2	0.11-0.13	7.4-8.4	2-4	High------	0.37	5	4	1-2
	4-27	35-50	1.30-1.40	0.06-0.2	0.11-0.13	7.4-8.4	2-4	High------	0.37			
	27-60	35-50	1.30-1.40	0.06-0.2	0.11-0.13	7.4-8.4	2-4	High------	0.37			
Hg---------------- Havre	0-5	12-27	1.15-1.35	0.6-2.0	0.16-0.20	6.1-7.8	<2	Low--------	0.37	5	4L	.5-2
	5-60	18-30	1.35-1.55	0.6-2.0	0.14-0.18	7.4-8.4	<4	Moderate	0.43			
Hh*:												
Havre-----------	0-5	12-27	1.15-1.35	0.6-2.0	0.16-0.20	6.1-7.8	<2	Low--------	0.37	5	4L	.5-2
	5-60	18-30	1.35-1.55	0.6-2.0	0.14-0.18	7.4-8.4	<4	Moderate	0.43			
Harlem----------	0-4	40-50	1.25-1.35	0.06-0.2	0.11-0.18	7.4-8.4	2-4	High------	0.37	5	4	1-2
	4-27	35-50	1.30-1.40	0.06-0.2	0.11-0.18	7.4-8.4	2-4	High------	0.37			
	27-60	35-50	1.30-1.40	0.06-0.2	0.11-0.18	7.4-8.4	4-8	High------	0.37			
Hk---------------- Heil	0-1	18-35	1.20-1.40	<0.06	0.15-0.24	5.6-7.3	<2	Moderate	0.28	3	7	3-6
	1-18	45-60	1.20-1.70	<0.06	0.13-0.18	6.1-9.0	4-16	High------	0.28			
	18-60	20-50	1.20-1.70	<0.06	0.13-0.18	7.4-9.0	4-16	High------	0.28			
HsB*:												
Hisle-----------	0-1	18-27	1.10-1.25	0.6-2.0	0.16-0.20	6.1-7.8	<2	Low--------	0.28	3	6	1-3
	1-34	50-60	1.25-1.40	<0.06	0.05-0.12	7.4-9.0	2-16	Very high	0.37			
	34-60	---	---	---	---	---	---	----------	----			
Slickspots.												
KcF*:												
Kirby-----------	0-7	10-20	1.45-1.65	2.0-6.0	0.08-0.10	7.4-8.4	<2	Low--------	0.15	1	8	1-2
	7-14	8-22	1.60-1.80	6.0-20	0.-0.01	7.9-8.4	<2	Low--------	0.05			
	14-60	---	---	>20	0.-0.01	7.9-8.4	<2	Low--------	0.00			
Cabbart---------	0-4	20-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.32	2	4L	1-2
	4-11	20-27	1.25-1.35	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low--------	0.32			
	11-60	---	---	---	---	---	---	----------	----			
Rock outcrop.												
Ke, Kg----------- Korchea	0-7	18-27	1.20-1.50	0.6-2.0	0.17-0.21	6.6-8.4	<2	Low--------	0.28	5	5	2-6
	7-60	18-35	1.30-1.60	0.6-2.0	0.16-0.18	7.4-9.0	<2	Moderate	0.28			
Km*:												
Korchea---------	0-7	18-27	1.20-1.50	0.6-2.0	0.17-0.21	6.6-8.4	<2	Low--------	0.28	5	5	2-6
	7-60	18-35	1.30-1.60	0.6-2.0	0.16-0.18	7.4-9.0	<2	Moderate	0.28			
Archin----------	0-4	5-15	1.35-1.65	2.0-6.0	0.14-0.17	5.6-7.3	<2	Low--------	0.24	3	3	1-3
	4-6	7-20	1.35-1.60	0.6-2.0	0.12-0.17	5.6-7.3	<2	Low--------	0.24			
	6-17	20-35	1.35-1.65	<0.2	0.13-0.15	5.6-7.8	2-4	Moderate	0.37			
	17-28	10-30	1.35-1.65	<0.2	0.10-0.15	7.4-9.0	2-8	Moderate	0.37			
	28-60	10-25	1.40-1.60	0.2-2.0	0.09-0.15	7.4-9.0	2-8	Low--------	0.37			
KoA-------------- Kremlin	0-6	18-27	---	0.6-2.0	0.16-0.20	6.1-7.8	<2	Low--------	0.28	5	6	1-3
	6-20	18-30	---	0.6-2.0	0.16-0.20	6.6-7.8	<2	Moderate	0.37			
	20-38	18-30	---	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37			
	38-60	10-25	---	0.6-2.0	0.14-0.18	7.4-9.0	<4	Low--------	0.37			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
KrA*:												
Kremlin---------	0-6	18-27	---	0.6-2.0	0.16-0.20	6.1-7.8	<2	Low-------	0.28	5	6	1-3
	6-20	18-30	---	0.6-2.0	0.16-0.20	6.6-7.8	<2	Moderate	0.37			
	20-38	18-30	---	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37			
	38-60	10-25	---	0.6-2.0	0.14-0.18	7.4-9.0	<4	Low-------	0.37			
Archin----------	0-4	5-15	1.35-1.65	2.0-6.0	0.14-0.17	5.6-7.3	<2	Low-------	0.24	3	3	1-3
	4-6	7-20	1.35-1.60	0.6-2.0	0.12-0.17	5.6-7.3	<2	Low-------	0.24			
	6-17	20-35	1.35-1.65	<0.2	0.13-0.15	5.6-7.8	2-4	Moderate	0.37			
	17-28	10-30	1.35-1.65	<0.2	0.10-0.15	7.4-9.0	2-8	Moderate	0.37			
	28-60	10-25	1.40-1.60	0.2-2.0	0.09-0.15	7.4-9.0	2-8	Low-------	0.37			
KyB-------------- Kyle	0-5	50-65	1.15-1.30	<0.06	0.08-0.12	6.6-7.8	<2	Very high	0.37	5	4	1-3
	5-20	60-65	1.15-1.30	<0.06	0.08-0.12	7.4-8.4	<4	Very high	0.37			
	20-60	60-65	1.15-1.30	<0.06	0.08-0.12	7.4-8.4	2-8	Very high	0.37			
Le--------------- Lallie	0-5	27-60	1.20-1.40	0.06-0.2	0.15-0.23	6.6-9.0	<8	High------	0.37	5	7	2-6
	5-60	35-60	1.20-1.40	0.06-0.2	0.13-0.23	7.4-9.0	<8	High------	0.37			
LhD*:												
Lismas----------	0-3	55-70	1.20-1.35	<0.06	0.08-0.12	6.1-7.8	<2	Very high	0.37	2	4	1-2
	3-15	55-70	1.15-1.30	<0.06	0.07-0.11	5.6-7.8	<4	Very high	0.37			
	15-60	---	---	---	---	---	---	----------	----			
Hisle-----------	0-1	18-27	1.10-1.25	0.6-2.0	0.16-0.20	6.1-7.8	<2	Low-------	0.28	3	6	1-3
	1-34	50-60	1.25-1.40	<0.06	0.05-0.12	7.4-9.0	2-16	Very high	0.37			
	34-60	---	---	---	---	6.1-8.4	---	----------	----			
LkD*:												
Lismas----------	0-3	55-70	1.20-1.35	<0.06	0.08-0.12	6.1-7.8	<2	Very high	0.37	2	4	1-2
	3-15	55-70	1.15-1.30	<0.06	0.07-0.11	5.6-7.8	<4	Very high	0.37			
	15-60	---	---	---	---	---	---	----------	----			
Winler----------	0-3	50-70	1.05-1.15	<0.06	0.08-0.14	6.1-7.8	<2	Very high	0.37	4	4	1-3
	3-16	60-75	1.05-1.15	<0.06	0.08-0.12	6.1-7.8	2-4	Very high	0.37			
	16-25	55-65	1.10-1.25	<0.06	0.04-0.10	5.6-8.4	2-4	Very high	0.37			
	25-60	---	---	---	---	4.5-7.8	---	----------	----			
LrF*:												
Lismas----------	0-3	55-70	1.20-1.35	<0.06	0.08-0.12	6.1-7.8	<2	Very high	0.37	2	4	1-2
	3-15	55-70	1.15-1.30	<0.06	0.07-0.11	5.6-7.8	<4	Very high	0.37			
	15-60	---	---	---	---	---	---	----------	----			
Rock outcrop.												
MaB-------------- Marmarth	0-7	12-20	1.10-1.30	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low-------	0.24	4	3	1-4
	7-20	18-35	1.20-1.50	0.6-2.0	0.14-0.18	6.1-7.8	<2	Moderate	0.28			
	20-35	15-30	1.20-1.50	0.6-2.0	0.14-0.18	7.4-8.4	<2	Moderate	0.28			
	35-60	---	---	---	---	---	---	----------	----			
McC*:												
Marmarth--------	0-7	12-20	1.10-1.30	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low-------	0.24	4	3	1-4
	7-20	18-35	1.20-1.50	0.6-2.0	0.14-0.18	6.1-7.8	<2	Moderate	0.28			
	20-35	15-30	1.20-1.50	0.6-2.0	0.14-0.18	7.4-8.4	<2	Moderate	0.28			
	35-60	---	---	---	---	---	---	----------	----			
Cabbart---------	0-4	20-27	1.20-1.30	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low-------	0.32	2	4L	1-2
	4-11	20-27	1.25-1.35	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low-------	0.32			
	11-60	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
MpB*:												
Marmarth	0-7	12-20	1.10-1.30	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low	0.24	4	3	1-4
	7-20	18-35	1.20-1.50	0.6-2.0	0.14-0.18	6.1-7.8	<2	Moderate	0.28			
	20-35	15-30	1.20-1.50	0.6-2.0	0.14-0.18	7.4-8.4	<2	Moderate	0.28			
	35-60	---	---	---	---	---	---	---	---			
Parchin	0-5	5-15	1.35-1.65	2.0-6.0	0.13-0.16	5.1-7.3	<2	Low	0.24	3	3	1-3
	5-10	5-15	1.35-1.65	2.0-6.0	0.08-0.14	5.6-7.3	<2	Low	0.24			
	10-18	20-35	1.50-1.85	<0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.37			
	18-34	15-30	1.40-1.60	0.6-2.0	0.11-0.13	7.4-9.0	2-8	Low	0.37			
	34-60	---	---	---	---	---	---	---	---			
MtC*, MtD*:												
Marmarth	0-7	12-20	1.10-1.30	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low	0.24	4	3	1-4
	7-20	18-35	1.20-1.50	0.6-2.0	0.14-0.18	6.1-7.8	<2	Moderate	0.28			
	20-35	15-30	1.20-1.50	0.6-2.0	0.14-0.18	7.4-8.4	<2	Moderate	0.28			
	35-60	---	---	---	---	---	---	---	---			
Twilight	0-4	15-20	1.35-1.50	0.6-6.0	0.10-0.14	6.1-7.8	<2	Low	0.20	4	3	1-2
	4-12	10-18	1.35-1.50	2.0-6.0	0.09-0.13	6.1-7.8	<2	Low	0.24			
	12-30	7-18	1.40-1.60	2.0-6.0	0.08-0.13	6.6-8.4	<2	Low	0.24			
	30-60	---	---	---	---	---	---	---	---			
NaD*:												
Nihill Variant	0-3	15-25	1.30-1.50	2.0-6.0	0.15-0.17	6.1-7.8	<2	Low	0.20	4	6	1-3
	3-18	10-25	1.35-1.65	2.0-6.0	0.07-0.13	7.4-8.4	<2	Low	0.20			
	18-30	2-10	1.50-1.70	2.0-6.0	0.12-0.15	7.4-8.4	<2	Low	0.15			
	30-60	---	---	---	---	---	---	---	---			
Attewan	0-5	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low	0.28	4	6	1-3
	5-20	24-35	1.30-1.40	0.6-2.0	0.16-0.22	6.6-7.8	<2	Moderate	0.32			
	20-32	20-27	1.20-1.35	0.6-2.0	0.16-0.18	7.4-9.0	<2	Low	0.32			
	32-60	5-12	1.50-1.75	>6.0	0.03-0.06	7.4-9.0	<2	Low	0.10			
PbB*:												
Parchin	0-5	5-15	1.35-1.65	2.0-6.0	0.13-0.16	5.1-7.3	<2	Low	0.24	3	3	1-3
	5-10	5-15	1.35-1.65	2.0-6.0	0.08-0.14	5.6-7.3	<2	Low	0.24			
	10-18	18-34	1.50-1.85	<0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.37			
	18-34	15-30	1.40-1.60	0.6-2.0	0.11-0.13	7.4-9.0	2-8	Low	0.37			
	34-60	---	---	---	---	---	---	---	---			
Bullock	0-4	5-10	1.35-1.60	2.0-6.0	0.12-0.17	6.1-7.8	<2	Low	0.28	3	3	1-2
	4-9	18-35	1.50-1.80	<0.2	0.13-0.17	6.6-8.4	<4	Moderate	0.37			
	9-20	18-35	1.45-1.70	<0.06	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	20-29	10-35	1.40-1.60	0.06-2.0	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	29-60	---	---	---	---	---	---	---	---			
PhA: Parshall	0-8	5-20	1.20-1.50	2.0-6.0	0.16-0.18	5.6-8.4	<2	Low	0.20	5	3	1-4
	8-60	5-20	1.20-1.50	2.0-6.0	0.12-0.17	5.6-8.4	<2	Low	0.20			
Pt*. Pits												
RbB: Reeder	0-6	10-27	1.10-1.30	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-5
	6-30	18-35	1.20-1.40	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	30-60	---	---	---	---	---	---	---	---			
RcC*:												
Reeder	0-6	10-27	1.10-1.30	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-5
	6-30	18-35	1.20-1.40	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	30-60	---	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
RcC*:												
Cabba-----------	0-2	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	<2	Low-------	0.32	2	4L	.5-1
	2-15	20-27	1.25-1.35	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low-------	0.32			
	15-60	---	---	---	---	---	---	----------	----			
ReB*:												
Reeder----------	0-6	10-27	1.10-1.30	0.6-2.0	0.20-0.23	6.1-7.3	<2	Moderate	0.28	4	6	3-5
	6-30	18-35	1.20-1.40	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.28			
	30-60	---	---	---	---	---	---	----------	----			
Rhoades---------	0-2	10-27	1.10-1.30	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low-------	0.32	3	6	2-6
	2-15	35-50	1.20-1.50	<0.2	0.10-0.12	>6.5	2-16	High------	0.32			
	15-32	20-45	1.20-1.50	<0.2	0.10-0.12	>7.3	8-16	High------	0.32			
	32-60	---	---	---	---	---	---	----------	----			
RfE*:												
Reva------------	0-3	12-20	1.35-1.50	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.20	2	8	1-4
	3-16	10-20	1.45-1.70	2.0-6.0	0.06-0.12	7.4-8.4	2-4	Low-------	0.20			
	16-24	---	---	---	---	---	---	----------	----			
Slimbutte-------	0-5	18-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	<2	Low-------	0.24	5	8	3-6
	5-12	15-26	1.40-1.60	0.6-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.24			
	12-31	12-26	1.45-1.70	0.6-6.0	0.09-0.14	7.4-8.4	<2	Low-------	0.24			
	31-43	10-25	1.50-1.75	2.0-6.0	0.07-0.12	7.4-8.4	<2	Low-------	0.24			
	43-60	10-25	1.75-2.00	6.0-20	0.02-0.10	7.4-8.4	<2	Low-------	0.24			
RgE*:												
Reva------------	0-3	12-20	1.35-1.50	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.20	2	8	1-4
	3-16	10-20	1.45-1.70	2.0-6.0	0.06-0.12	7.4-8.4	2-4	Low-------	0.20			
	16-24	---	---	---	---	---	---	----------	----			
Rock outcrop.												
RhB--------------	0-5	8-18	1.10-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low-------	0.20	4	3	1-3
Rhame	5-14	8-18	1.10-1.50	2.0-6.0	0.15-0.17	6.6-7.8	<2	Low-------	0.20			
	14-28	8-18	1.10-1.50	2.0-6.0	0.14-0.16	6.6-8.4	<2	Low-------	0.20			
	28-60	---	---	---	---	---	---	----------	----			
RmB*:												
Rhame-----------	0-5	8-18	1.10-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low-------	0.20	4	3	1-3
	5-22	8-18	1.10-1.50	2.0-6.0	0.15-0.17	6.6-7.8	<2	Low-------	0.20			
	22-30	8-18	1.10-1.50	2.0-6.0	0.14-0.16	6.6-8.4	<2	Low-------	0.20			
	30-60	---	---	---	---	---	---	----------	----			
Parchin---------	0-5	5-15	1.35-1.65	2.0-6.0	0.13-0.16	5.1-7.3	<2	Low-------	0.24	3	3	1-3
	5-10	5-15	1.35-1.65	2.0-6.0	0.08-0.14	5.6-7.3	<2	Low-------	0.24			
	10-18	18-34	1.50-1.85	<0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.37			
	18-34	15-30	1.40-1.60	0.6-2.0	0.11-0.13	7.4-9.0	2-8	Low-------	0.37			
	34-60	---	---	---	---	---	---	----------	----			
RnA*:												
Rhoades---------	0-2	10-27	1.10-1.30	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low-------	0.32	3	6	2-6
	2-28	35-50	1.20-1.50	<0.2	0.10-0.12	>6.5	2-16	High------	0.32			
	28-60	20-45	1.20-1.50	<0.2	0.10-0.12	>7.3	8-16	High------	0.32			
Daglum----------	0-8	10-25	1.20-1.50	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low-------	0.32	3	6	2-4
	8-38	35-50	1.30-1.60	<0.06	0.12-0.14	6.1-9.0	2-8	High------	0.32			
	38-60	35-50	1.50-1.70	<0.06	0.12-0.14	7.9-9.0	8-16	High------	0.32			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
RnB*:												
Rhoades---------	0-2	10-27	1.10-1.30	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low-------	0.32	3	6	2-6
	2-15	35-50	1.20-1.50	<0.2	0.10-0.12	>6.5	2-16	High------	0.32			
	15-32	20-45	1.20-1.50	<0.2	0.10-0.12	>7.3	8-16	High------	0.32			
	32-60	---	---	---	---	---	---	----------	----			
Daglum----------	0-8	10-25	1.20-1.50	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low-------	0.32	3	6	2-4
	8-19	35-50	1.30-1.60	<0.06	0.12-0.14	6.1-9.0	2-8	High------	0.32			
	19-39	35-50	1.50-1.70	<0.06	0.12-0.14	7.9-9.0	8-16	High------	0.32			
	39-60	---	---	---	---	---	---	----------	----			
RoF*. Rock outcrop												
RrF*:												
Rock outcrop.												
Reva------------	0-3	12-20	1.35-1.50	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.20	2	8	1-4
	3-16	10-20	1.45-1.70	2.0-6.0	0.06-0.12	7.4-8.4	2-4	Low-------	0.20			
	16-24	---	---	---	---	---	---	----------	----			
RsF*:												
Rockoa----------	0-5	15-20	1.30-1.45	0.6-2.0	0.15-0.17	5.6-7.3	<2	Low-------	0.20	5	8	1-4
	5-21	18-30	1.35-1.60	0.6-2.0	0.14-0.18	5.6-7.3	<2	Low-------	0.24			
	21-60	15-25	1.60-1.70	0.6-6.0	0.13-0.17	5.6-7.3	<2	Low-------	0.24			
Reva------------	0-3	12-20	1.35-1.50	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.20	2	8	1-4
	3-16	10-20	1.45-1.70	2.0-6.0	0.06-0.12	7.4-8.4	2-4	Low-------	0.20			
	16-24	---	---	---	---	---	---	----------	----			
SaA-------------- Sage	0-5	18-27	1.20-1.30	0.2-2.0	0.18-0.20	6.1-8.4	>16	Moderate	0.32	5	6	1-2
	5-40	35-60	1.25-1.40	<0.2	0.06-0.09	5.1-9.0	>16	Very high	0.32			
	40-50	40-60	1.25-1.40	<0.2	0.03-0.06	5.1-9.0	>8	Very high	0.32			
	50-60	---	---	---	---	---	---	----------	----			
SbA*:												
Sage------------	0-5	30-40	1.20-1.30	<0.2	0.10-0.13	6.1-8.4	>16	High------	0.32	5	7	1-2
	5-40	35-60	1.25-1.40	<0.2	0.06-0.09	5.1-9.0	>16	Very high	0.32			
	40-50	40-60	1.25-1.40	<0.2	0.03-0.06	5.1-9.0	>8	Very high	0.32			
	50-60	---	---	---	---	---	---	----------	----			
Hisle Variant---	0-1	15-27	1.10-1.25	0.6-2.0	0.14-0.17	6.1-7.3	<2	Moderate	0.28	3	6	1-2
	1-13	40-55	1.25-1.40	<0.06	0.09-0.13	6.1-8.4	2-16	High------	0.37			
	13-38	40-55	1.25-1.40	<0.06	0.09-0.13	5.6-8.4	2-16	High------	0.37			
	38-60	---	---	---	---	---	---	----------	----			
SgA-------------- Savage	0-6	27-40	1.15-1.35	0.6-2.0	0.18-0.23	6.1-7.8	<2	Moderate	0.32	5	7	2-4
	6-23	35-45	1.25-1.50	0.06-0.6	0.12-0.20	6.6-7.8	<2	High------	0.37			
	23-38	35-45	1.30-1.50	0.06-0.6	0.12-0.20	7.4-8.4	2-4	High------	0.37			
	38-60	35-45	1.30-1.50	0.06-0.6	0.12-0.20	7.4-8.4	4-8	High------	0.37			
ShB-------------- Shambo	0-5	10-27	1.10-1.30	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low-------	0.28	5	6	2-6
	5-15	18-30	1.20-1.50	0.6-2.0	0.17-0.19	6.6-8.4	<2	Moderate	0.28			
	15-60	18-30	1.20-1.50	0.6-2.0	0.17-0.19	7.4-9.0	<2	Moderate	0.28			
SmB*:												
Shambo----------	0-5	10-27	1.10-1.30	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low-------	0.28	5	6	2-6
	5-15	18-30	1.20-1.50	0.6-2.0	0.17-0.19	6.6-8.4	<2	Moderate	0.28			
	15-60	18-30	1.20-1.50	0.6-2.0	0.17-0.19	7.4-9.0	<2	Moderate	0.28			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
SmB*:												
Rhoades---------	0-2	10-27	1.10-1.30	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low-------	0.32	3	6	2-6
	2-28	35-50	1.20-1.50	<0.2	0.10-0.12	>6.5	2-16	High------	0.32			
	28-60	20-45	1.20-1.50	<0.2	0.10-0.12	>7.3	8-16	High------	0.32			
Sn*.												
Slickspots												
SpC*:												
Slimbutte-------	0-5	18-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	<2	Low-------	0.24	5	6	3-6
	5-12	15-26	1.40-1.60	0.6-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.24			
	12-31	12-26	1.45-1.70	0.6-6.0	0.09-0.14	7.4-8.4	<2	Low-------	0.24			
	31-43	10-25	1.50-1.75	2.0-6.0	0.07-0.12	7.4-8.4	<2	Low-------	0.24			
	43-60	10-25	1.75-2.00	6.0-20	0.02-0.10	7.4-8.4	<2	Low-------	0.24			
Arnegard--------	0-11	15-25	1.00-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Moderate	0.28	5	6	3-6
	11-32	18-30	1.20-1.60	0.6-2.0	0.16-0.22	6.1-7.8	<2	Moderate	0.28			
	32-60	5-30	1.20-1.60	0.6-2.0	0.14-0.18	6.6-8.4	<2	Low-------	0.28			
Reva------------	0-9	12-20	1.35-1.50	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.20	2	8	1-4
	9-23	10-20	1.45-1.70	2.0-6.0	0.06-0.12	7.4-8.4	2-4	Low-------	0.20			
	23-60	---	---	---	---	---	---	----------	----			
SrE*:												
Slimbutte-------	0-5	18-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	<2	Low-------	0.24	5	6	3-6
	5-12	15-26	1.40-1.60	0.6-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.24			
	12-31	12-26	1.45-1.70	0.6-6.0	0.09-0.14	7.4-8.4	<2	Low-------	0.24			
	31-43	10-25	1.50-1.75	2.0-6.0	0.07-0.12	7.4-8.4	<2	Low-------	0.24			
	43-60	10-25	1.75-2.00	6.0-20	0.02-0.10	7.4-8.4	<2	Low-------	0.24			
Reva------------	0-3	12-20	1.35-1.50	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low-------	0.20	2	8	1-4
	3-16	10-20	1.45-1.70	2.0-6.0	0.06-0.12	7.4-8.4	2-4	Low-------	0.20			
	16-24	---	---	---	---	---	---	----------	----			
SwA-------------	0-2	55-70	1.05-1.15	<0.06	0.08-0.12	6.6-9.0	<2	Very high	0.37	5	4	1-2
Swanboy	2-60	60-70	1.10-1.30	<0.06	0.05-0.12	7.4-9.0	2-16	Very high	0.37			
SyA*:												
Swanboy---------	0-2	55-70	1.05-1.15	<0.06	0.08-0.12	6.6-9.0	<2	Very high	0.37	5	4	1-2
	2-60	60-70	1.10-1.30	<0.06	0.05-0.12	7.4-9.0	2-16	Very high	0.37			
Slickspots.												
TnB-------------	0-9	27-35	1.15-1.35	0.06-0.2	0.16-0.20	6.6-7.8	<2	Moderate	0.32	4	7	2-4
Tanna	9-36	35-45	1.25-1.50	0.06-0.2	0.14-0.17	6.6-8.4	<4	Moderate	0.37			
	36-60	---	---	---	---	---	---	----------	----			
ToA*:												
Tanna-----------	0-9	27-35	1.15-1.35	0.06-0.2	0.16-0.20	6.6-7.8	<2	Moderate	0.32	4	7	2-4
	9-36	35-45	1.25-1.50	0.06-0.2	0.14-0.17	6.6-8.4	<4	Moderate	0.37			
	36-60	---	---	---	---	---	---	----------	----			
Gerdrum---------	0-2	20-27	1.10-1.25	0.6-2.0	0.18-0.22	6.6-7.8	<2	Low-------	0.37	5	6	1-3
	2-36	35-55	1.25-1.50	<0.06	0.10-0.13	7.4-9.0	2-8	High------	0.37			
	36-60	30-50	1.30-1.50	<0.06	0.08-0.10	7.9-9.0	8-16	High------	0.43			
ToC*:												
Tanna-----------	0-9	27-35	1.15-1.35	0.06-0.2	0.16-0.20	6.6-7.8	<2	Moderate	0.32	4	7	2-4
	9-36	35-45	1.25-1.50	0.06-0.2	0.14-0.17	6.6-8.4	<4	Moderate	0.37			
	36-60	---	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
ToC*:												
Rhoades----------	0-2	10-27	1.10-1.30	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low--------	0.32	3	6	2-6
	2-15	35-50	1.20-1.50	<0.2	0.10-0.12	>6.5	2-16	High-------	0.32			
	15-32	20-45	1.20-1.50	<0.2	0.10-0.12	>7.3	8-16	High-------	0.32			
	32-60	---	---	---	---	---	---	-----------	----			
TrB---------------	0-4	3-15	1.35-1.50	6.0-20	0.10-0.12	6.1-7.8	<2	Low--------	0.17	4	2	.5-1
Trey	4-30	3-15	1.45-1.60	6.0-20	0.06-0.10	6.1-7.8	<2	Low--------	0.17			
	30	---	---	---	---	---	---	-----------	----			
TtC*:												
Trey--------------	0-5	3-15	1.35-1.50	6.0-20	0.10-0.12	6.1-7.8	<2	Low--------	0.17	4	2	.5-1
	5-16	3-15	1.45-1.60	6.0-20	0.06-0.10	6.1-7.8	<2	Low--------	0.17			
	16-60	---	---	---	---	---	---	-----------	----			
Fleak-------------	0-3	0-15	1.10-1.50	6.0-20	0.06-0.12	6.6-8.4	<2	Low--------	0.17	2	2	<1
	3-16	0-15	1.10-1.50	6.0-20	0.06-0.10	6.6-8.4	<2	Low--------	0.17			
	16-60	---	---	---	---	---	---	-----------	----			
TvB*:												
Trey--------------	0-4	3-15	1.35-1.50	6.0-20	0.10-0.12	6.1-7.8	<2	Low--------	0.17	4	2	.5-1
	4-30	3-15	1.45-1.60	6.0-20	0.06-0.10	6.1-7.8	<2	Low--------	0.17			
	30	---	---	---	---	---	---	-----------	----			
Parchin-----------	0-5	5-15	1.35-1.65	2.0-6.0	0.13-0.16	5.1-7.3	<2	Low--------	0.24	3	3	1-3
	5-10	5-15	1.35-1.65	2.0-6.0	0.08-0.14	5.6-7.3	<2	Low--------	0.24			
	10-18	18-34	1.50-1.85	<0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.37			
	18-34	15-30	1.40-1.60	0.6-2.0	0.11-0.13	7.4-9.0	2-8	Low--------	0.37			
	34-60	---	---	---	---	---	---	-----------	----			
Bullock-----------	0-4	5-10	1.35-1.60	2.0-6.0	0.12-0.17	6.1-7.8	<2	Low--------	0.28	3	3	1-2
	4-9	18-35	1.50-1.80	<0.2	0.13-0.17	6.6-8.4	<4	Moderate	0.37			
	9-20	18-35	1.45-1.70	<0.06	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	20-29	10-35	1.40-1.60	0.06-2.0	0.07-0.15	7.4-9.0	4-8	Moderate	0.37			
	29-60	---	---	---	---	---	---	-----------	----			
TwC---------------	0-4	15-20	1.35-1.50	0.6-6.0	0.10-0.14	6.1-7.8	<2	Low--------	0.24	4	3	1-2
Twilight	4-12	10-18	1.35-1.50	0.6-6.0	0.09-0.13	6.1-7.8	<2	Low--------	0.24			
	12-30	7-18	1.40-1.60	2.0-6.0	0.08-0.13	6.6-8.4	<2	Low--------	0.24			
	30-60	---	---	---	---	---	---	-----------	----			
TxE*:												
Twilight----------	0-4	15-20	1.35-1.50	0.6-6.0	0.10-0.14	6.1-7.8	<2	Low--------	0.24	4	3	1-2
	4-12	10-18	1.35-1.50	0.6-6.0	0.09-0.13	6.1-7.8	<2	Low--------	0.24			
	12-30	7-18	1.40-1.60	2.0-6.0	0.08-0.13	6.6-8.4	<2	Low--------	0.24			
	30-60	---	---	---	---	---	---	-----------	----			
Blackhall---------	0-4	10-20	---	0.6-2.0	0.15-0.18	7.9-8.4	<2	Low--------	0.24	2	5	1-2
	4-18	5-18	---	0.6-2.0	0.12-0.14	7.9-8.4	<2	Low--------	0.28			
	18-60	---	---	---	---	---	---	-----------	----			
TyC*:												
Twilight----------	0-4	15-20	1.35-1.50	0.6-6.0	0.10-0.14	6.1-7.8	<2	Low--------	0.24	4	3	1-2
	4-12	10-18	1.35-1.50	0.6-6.0	0.09-0.13	6.1-7.8	<2	Low--------	0.24			
	12-30	7-18	1.40-1.60	2.0-6.0	0.08-0.13	6.6-8.4	<2	Low--------	0.24			
	30-60	---	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
TyC*:												
Parchin----------	0-5	5-15	1.35-1.65	2.0-6.0	0.13-0.16	5.1-7.3	<2	Low--------	0.24	3	3	1-3
	5-10	5-15	1.35-1.65	2.0-6.0	0.08-0.14	5.6-7.3	<2	Low--------	0.24			
	10-18	18-34	1.50-1.85	<0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.37			
	18-34	15-30	1.40-1.60	0.6-2.0	0.11-0.13	7.4-9.0	2-8	Low--------	0.37			
	34-60	---	---	---	---	---	---	-----------	----			
TzA-------------- Twotop	0-4	60-70	1.05-1.15	<0.06	0.08-0.12	6.6-7.8	<2	Very high	0.37	5	4	1-3
	4-60	60-70	1.10-1.25	<0.06	0.08-0.12	6.6-7.8	<4	Very high	0.37			
VaF*:												
Vanocker---------	0-2	20-27	1.25-1.40	0.6-2.0	0.10-0.12	5.6-7.3	<2	Moderate	0.17	3	8	5-10
	2-12	25-34	1.40-1.60	0.6-2.0	0.09-0.11	5.6-7.8	<2	Moderate	0.24			
	12-30	25-34	1.45-1.70	0.6-2.0	0.09-0.11	7.4-8.4	<2	Moderate	0.24			
	30-60	20-27	1.45-1.70	0.6-2.0	0.09-0.11	7.4-8.4	<2	Moderate	0.24			
Reva-------------	0-3	12-20	1.35-1.50	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low--------	0.20	2	8	1-4
	3-16	10-20	1.45-1.70	2.0-6.0	0.06-0.12	7.4-8.4	2-4	Low--------	0.20			
	16-24	---	---	---	---	---	---	-----------	----			
VbB-------------- Vebar	0-20	10-18	1.20-1.60	2.0-6.0	0.15-0.17	6.1-7.8	<2	Low--------	0.20	4	3	1-4
	20-32	10-18	1.20-1.60	2.0-6.0	0.15-0.17	6.1-8.4	<2	Low--------	0.20			
	32-60	---	---	---	---	---	---	-----------	----			
VcC*, VcD*:												
Vebar------------	0-20	10-18	1.20-1.60	2.0-6.0	0.15-0.17	6.1-7.8	<2	Low--------	0.20	4	3	1-4
	20-32	10-18	1.20-1.60	2.0-6.0	0.15-0.17	6.1-8.4	<2	Low--------	0.20			
	32-60	---	---	---	---	---	---	-----------	----			
Cohagen----------	0-16	10-18	1.20-1.60	0.6-6.0	0.13-0.18	6.6-8.4	<2	Low--------	0.24	2	3	<1
	16-60	---	---	---	---	---	---	-----------	----			
WaB*:												
Watrous----------	0-8	18-27	1.10-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Moderate	0.28	4	6	3-6
	8-30	25-35	1.20-1.50	0.6-2.0	0.15-0.19	6.1-8.4	<2	Moderate	0.28			
	30-60	---	---	---	---	---	---	-----------	----			
Werner-----------	0-6	14-27	1.20-1.40	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.28	2	6	2-4
	6-13	14-35	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Moderate	0.28			
	13-60	---	---	---	---	---	---	-----------	----			
WbB*:												
Watrous----------	0-8	18-27	1.10-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Moderate	0.28	4	6	3-6
	8-30	25-35	1.20-1.50	0.6-2.0	0.15-0.19	6.1-8.4	<2	Moderate	0.28			
	30-60	---	---	---	---	---	---	-----------	----			
Rhoades----------	0-1	10-27	1.10-1.30	0.6-6.0	0.13-0.15	5.6-7.3	<2	Low--------	0.32	3	6	2-6
	1-18	35-50	1.20-1.50	<0.2	0.10-0.12	>6.5	2-16	High-------	0.32			
	18-27	20-45	1.20-1.50	<0.2	0.10-0.12	>7.3	8-16	High-------	0.32			
	27-60	---	---	---	---	---	---	-----------	----			
WdC*:												
Werner-----------	0-6	14-27	1.20-1.40	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.28	2	6	2-4
	6-13	14-35	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Moderate	0.28			
	13-60	---	---	---	---	---	---	-----------	----			
Reva-------------	0-3	12-20	1.35-1.50	2.0-6.0	0.10-0.15	6.1-7.8	<2	Low--------	0.20	2	8	1-4
	3-16	10-20	1.45-1.70	2.0-6.0	0.06-0.12	7.4-8.4	2-4	Low--------	0.20			
	16-24	---	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
WeC*:												
Werner----------	0-6	14-27	1.20-1.40	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.28	2	6	2-4
	6-13	14-35	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Moderate	0.28			
	13-60	---	---	---	---	---	---	----------	----			
Watrous---------	0-8	18-27	1.10-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Moderate	0.28	4	6	3-6
	8-30	25-35	1.20-1.50	0.6-2.0	0.15-0.19	6.1-8.4	<2	Moderate	0.28			
	30-60	---	---	---	---	---	---	----------	----			
WhB*:												
Winler----------	0-3	50-70	1.05-1.15	<0.06	0.08-0.14	6.1-7.8	<2	Very high	0.37	4	4	1-3
	3-16	60-75	1.05-1.15	<0.06	0.08-0.12	6.1-7.8	2-4	Very high	0.37			
	16-25	55-65	1.10-1.25	<0.06	0.04-0.10	5.6-8.4	2-4	Very high	0.37			
	25-60	---	---	---	---	4.5-7.8	---	----------	----			
Hisle-----------	0-1	18-27	1.10-1.25	0.6-2.0	0.16-0.20	6.1-7.8	<2	Low-------	0.28	3	6	1-3
	1-34	50-60	1.25-1.40	<0.06	0.05-0.12	7.4-9.0	2-16	Very high	0.37			
	34-60	---	---	---	---	6.1-8.4	---	----------	----			
WsC*:												
Winler----------	0-3	50-70	1.05-1.15	<0.06	0.08-0.14	6.1-7.8	<2	Very high	0.37	4	4	1-3
	3-16	60-75	1.05-1.15	<0.06	0.08-0.12	6.1-7.8	2-4	Very high	0.37			
	16-25	55-65	1.10-1.25	<0.06	0.04-0.10	5.6-8.4	2-4	Very high	0.37			
	25-60	---	---	---	---	4.5-7.8	---	----------	----			
Lismas----------	0-3	55-70	1.20-1.35	<0.06	0.08-0.12	6.1-7.8	<2	Very high	0.37	2	4	1-2
	3-15	55-70	1.15-1.30	<0.06	0.07-0.11	5.6-7.8	<4	Very high	0.37			
	15-60	---	---	---	---	---	---	----------	----			
ZaB, ZaD--------- Zeona	0-3	2-8	1.30-1.50	6.0-20	0.10-0.12	5.6-7.3	<2	Low-------	0.17	5	2	1-2
	3-60	2-8	1.45-1.60	6.0-20	0.06-0.10	5.6-8.4	<2	Low-------	0.17			
ZbC*:												
Zeona-----------	0-3	2-8	1.30-1.50	6.0-20	0.10-0.12	5.6-7.3	<2	Low-------	0.17	5	2	1-2
	3-60	2-8	1.45-1.60	6.0-20	0.06-0.10	5.6-8.4	<2	Low-------	0.17			
Blownout land.												
ZpB*:												
Zeona-----------	0-3	2-8	1.30-1.50	6.0-20	0.10-0.12	5.6-7.3	<2	Low-------	0.17	5	2	1-2
	3-60	2-8	1.45-1.60	6.0-20	0.06-0.10	5.6-8.4	<2	Low-------	0.17			
Parchin---------	0-5	5-15	1.35-1.65	2.0-6.0	0.13-0.16	5.1-7.3	<2	Low-------	0.24	3	3	1-3
	5-10	5-15	1.35-1.65	2.0-6.0	0.08-0.14	5.6-7.3	<2	Low-------	0.24			
	10-18	18-34	1.50-1.85	<0.2	0.13-0.15	7.4-9.0	2-8	Moderate	0.37			
	18-34	15-30	1.40-1.60	0.6-2.0	0.11-0.13	7.4-9.0	2-8	Low-------	0.37			
	34-60	---	---	---	---	---	---	----------	----			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AaA, AaB---------- Amor	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
AcC*:												
Amor-------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
Cabba------------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	High-----	Low.
AdC*:												
Amor-------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
Rhoades----------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
AeB*:												
Amor-------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
Werner-----------	D	None---------	---	---	>6.0	---	---	7-20	Soft	Moderate	High-----	Low.
AkA*:												
Archin-----------	D	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Bullock----------	D	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	High.
Ar--------------- Arnegard	B	Occasional	Very brief	Mar-Oct	3.0-6.0	Perched	Mar-Oct	>60	---	Moderate	High-----	Low.
AsA, AsB---------- Assinniboine	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
AtA*:												
Assinniboine-----	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Archin-----------	D	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AwB---------------- Attewan	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
Ba*. Badlands												
BeC---------------- Boxwell	C	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	Low.
BkF---------------- Bullock	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	High.
BnA*: Bullock-----------	D	None---------	---	---	>6.0	---	---	>60	---	Low-------	High------	High.
Assinniboine------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
BoD*: Bullock-----------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	High.
Cabbart-----------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Low-------	High------	Low.
BpB*: Bullock-----------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	High.
Parchin-----------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	Moderate.
Slickspots.												
BsA*: Bullock-----------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	High.
Slickspots.												
CaD*: Cabba-------------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	High------	Low.
Lantry------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Low-------	Moderate	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
CaD*:												
Amor-------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
CbD*:												
Cabba------------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	High-----	Low.
Reeder-----------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
CcE---------------- Cabbart	D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	High-----	Low.
CdE*:												
Cabbart----------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Low.
Delridge---------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Low.
CeE*:												
Cabbart----------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Low.
Rock outcrop.												
ChA---------------- Chinook	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
CnA*:												
Chinook----------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Archin-----------	D	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
CoE---------------- Cohagen	D	None---------	---	---	>6.0	---	---	4-20	Soft	Moderate	Moderate	Low.
CrF*:												
Cohagen----------	D	None---------	---	---	>6.0	---	---	4-20	Soft	Moderate	Moderate	Low.
Rock outcrop.												
Cabba Variant----	B	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
DcC*:												
Delridge	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Low.
Cabbart	D	None	---	---	>6.0	---	---	10-20	Soft	Low	High	Low.
Du*. Dumps												
Dw*. Dune land												
EaA Eapa	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
EcA*:												
Eapa	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Archin	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
FaB Farnuf	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
FtE*:												
Fleak	D	None	---	---	>6.0	---	---	7-20	Soft	Low	Moderate	Moderate.
Trey	A	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	Low.
Rock outcrop.												
GdA Gerdrum	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Ge Glendive	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
GhB*:												
Glendive	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Archin	D	Rare	---	---	>6.0	---	---	>60	---	Low	High	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
GkA---------------- Grail	C	Frequent----	Very brief	Mar-Oct	3.0-6.0	Perched	Mar-Oct	>60	---	Moderate	High-----	Low.
GrA*:												
Grail------------	C	Frequent----	Very brief	Mar-Oct	3.0-6.0	Perched	Mar-Oct	>60	---	Moderate	High-----	Low.
Daglum-----------	D	None--------	---	---	>6.0	---	---	40-60	Soft	Moderate	High-----	Moderate.
Ha, Hb------------ Hanly	A	Rare--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
Hd*:												
Hanly------------	A	Rare--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
Dogiecreek--------	B	Occasional	Brief-----	Mar-Sep	0-3.0	Apparent	Oct-Jul	>60	---	High-----	High-----	High.
He*:												
Hanly------------	A	Rare--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
Slickspots.												
Hf---------------- Harlem	D	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Low------	High-----	Low.
Hg---------------- Havre	B	Rare--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Hh*:												
Havre------------	B	Rare--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Harlem-----------	C	Rare--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Hk---------------- Heil	D	None--------	---	---	+1-1.0	Apparent	Mar-Sep	>60	---	Moderate	High-----	Moderate.
HsB*:												
Hisle------------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Slickspots.												

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
KcF*:												
Kirby	A	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Cabbart	D	None	---	---	>6.0	---	---	10-20	Soft	Low	High	Low.
Rock outcrop.												
Ke Korchea	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Kg Korchea	B	Occasional	Very brief to brief.	Mar-Jun	>6.0	---	---	>60	---	Moderate	High	Moderate.
Km*:												
Korchea	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Archin	D	Rare	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
KoA Kremlin	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
KrA*:												
Kremlin	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Archin	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
KyB Kyle	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Le Lallie	D	Frequent	Long	Apr-Jun	0-1.0	Apparent	Apr-Aug	>60	---	High	High	Moderate.
LhD*:												
Lismas	D	None	---	---	>6.0	---	---	10-20	Soft	Low	High	Moderate.
Hisle	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
LkD*:												
Lismas	D	None	---	---	>6.0	---	---	10-20	Soft	Low	High	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
LkD*:												
Winler	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
LrF*:												
Lismas	D	None	---	---	>6.0	---	---	10-20	Soft	Low	High	Moderate.
Rock outcrop.												
MaB Marmarth	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	High	Low.
McC*:												
Marmarth	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	High	Low.
Cabbart	D	None	---	---	>6.0	---	---	10-20	Soft	Low	High	Low.
MpB*:												
Marmarth	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	High	Low.
Parchin	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
MtC*, MtD*:												
Marmarth	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	High	Low.
Twilight	B	None	---	---	>6.0	---	---	20-40	Soft	Low	Moderate	Low.
NaD*:												
Nihill Variant	B	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Low.
Attewan	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
PbB*:												
Parchin	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
Bullock	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	High.
PhA Parshall	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Pt*. Pits												
RbB----------------- Reeder	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
RcC*:												
Reeder------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
Cabba-------------	D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	High-----	Low.
ReB*:												
Reeder------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
Rhoades-----------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
RfE*:												
Reva--------------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
Slimbutte---------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
RgE*:												
Reva--------------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
Rock outcrop.												
RhB----------------- Rhame	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Low.
RmB*:												
Rhame-------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Low.
Parchin-----------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
RnA*:												
Rhoades-----------	D	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Daglum------------	D	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
RnB*:												
Rhoades-----------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
Daglum------------	D	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
RoF*. Rock outcrop												
RrF*: Rock outcrop.												
Reva-------------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
RsF*: Rockoa-----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Reva-------------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
SaA--------------- Sage	D	Occasional	Very brief	Nov-Jul	0-2.0	Perched	Nov-Jul	40-60	Soft	High-----	High-----	High.
SbA*: Sage-------------	D	Rare---------	---	---	0-2.0	Perched	Nov-Jul	40-60	Soft	High-----	High-----	High.
Hisle Variant----	C/D	Rare---------	---	---	1.0-2.0	Perched	Nov-Jun	20-40	Soft	Moderate	High-----	High.
SgA--------------- Savage	C	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
ShB--------------- Shambo	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
SmB*: Shambo-----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Rhoades----------	D	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Sn*. Slickspots												
SpC*: Slimbutte--------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Arnegard---------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
SpC*:												
Reva	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	High	Low.
SrE*:												
Slimbutte	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Reva	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	High	Low.
SwA Swanboy	D	None	---	---	>6.0	---	---	>60	---	Low	High	High.
SyA*:												
Swanboy	D	None	---	---	>6.0	---	---	>60	---	Low	High	High.
Slickspots.												
TnB Tanna	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Low.
ToA*:												
Tanna	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Low.
Gerdrum	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
ToC*:												
Tanna	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Low.
Rhoades	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
TrB Trey	A	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	Low.
TtC*:												
Trey	A	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	Low.
Fleak	D	None	---	---	>6.0	---	---	7-20	Soft	Low	Moderate	Moderate.
TvB*:												
Trey	A	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
TvB*:												
Parchin	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
Bullock	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	High.
TwC Twilight	B	None	---	---	>6.0	---	---	20-40	Soft	Low	Moderate	Low.
TxE*:												
Twilight	B	None	---	---	>6.0	---	---	20-40	Soft	Low	Moderate	Low.
Blackhall	D	None	---	---	>6.0	---	---	6-20	Soft	Low	High	Low.
TyC*:												
Twilight	B	None	---	---	>6.0	---	---	20-40	Soft	Low	Moderate	Low.
Parchin	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
TzA Twotop	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
VaF*:												
Vanocker	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Reva	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	High	Low.
VbB Vebar	B	None	---	---	>6.0	---	---	20-40	Soft	Low	Moderate	Low.
VcC*, VcD*:												
Vebar	B	None	---	---	>6.0	---	---	20-40	Soft	Low	Moderate	Low.
Cohagen	D	None	---	---	>6.0	---	---	4-20	Soft	Moderate	Moderate	Low.
WaB*:												
Watrous	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Low.
Werner	D	None	---	---	>6.0	---	---	7-20	Soft	Moderate	High	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
WbB*:												
Watrous----------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Low.
Rhoades----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
WdC*:												
Werner-----------	D	None--------	---	---	>6.0	---	---	7-20	Soft	Moderate	High-----	Low.
Reva-------------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
WeC*:												
Werner-----------	D	None--------	---	---	>6.0	---	---	7-20	Soft	Moderate	High-----	Low.
Watrous----------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Low.
WhB*:												
Winler-----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Hisle------------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
WsC*:												
Winler-----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Lismas-----------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Moderate.
ZaB, ZaD---------- Zeona	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
ZbC*:												
Zeona------------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Blownout land.												
ZpB*:												
Zeona------------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Parchin----------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Amor	Fine-loamy, mixed Typic Haploborolls
Archin	Fine-loamy, mixed Borollic Natrargids
Arnegard	Fine-loamy, mixed Pachic Haploborolls
Assinniboine	Fine-loamy, mixed Aridic Argiborolls
Attewan	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
*Blackhall	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Boxwell	Fine-loamy, mixed Aridic Haploborolls
Bullock	Fine-loamy, mixed Borollic Natrargids
Cabba	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabba Variant	Loamy, mixed (calcareous), frigid Lithic Ustorthents
Cabbart	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Chinook	Coarse-loamy, mixed Aridic Haploborolls
Cohagen	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Daglum	Fine, montmorillonitic Typic Natriborolls
Delridge	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Dogiecreek	Coarse-loamy, mixed (calcareous), frigid Typic Fluvaquents
Eapa	Fine-loamy, mixed Aridic Argiborolls
Farnuf	Fine-loamy, mixed Typic Argiborolls
Fleak	Mixed, frigid, shallow Ustic Torripsamments
Gerdrum	Fine, montmorillonitic Borollic Natrargids
Glendive	Coarse-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Grail	Fine, montmorillonitic Pachic Argiborolls
Hanly	Sandy, mixed, frigid Ustic Torrifluvents
Harlem	Fine, montmorillonitic (calcareous), frigid Ustic Torrifluvents
Havre	Fine-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Heil	Fine, montmorillonitic, frigid Typic Natraquolls
Hisle	Fine, montmorillonitic, mesic Ustollic Natrargids
Hisle Variant	Fine, montmorillonitic, mesic Aquic Natrargids
Kirby	Fragmental, mixed (calcareous), frigid Ustic Torriorthents
Korchea	Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents
Kremlin	Fine-loamy, mixed Aridic Haploborolls
Kyle	Very fine, montmorillonitic, mesic Typic Torrerts
Lallie	Fine, montmorillonitic (calcareous), frigid Typic Fluvaquents
Lantry	Fine-silty, mixed (calcareous), frigid Typic Ustorthents
Lismas	Clayey, montmorillonitic, nonacid, mesic, shallow Ustic Torriorthents
Marmarth	Fine-loamy, mixed Aridic Argiborolls
Nihill Variant	Loamy-skeletal, mixed (calcareous), frigid Ustic Torriorthents
Parchin	Fine-loamy, mixed Borollic Natrargids
Parshall	Coarse-loamy, mixed Pachic Haploborolls
Reeder	Fine-loamy, mixed Typic Argiborolls
Reva	Loamy-skeletal, mixed (calcareous), frigid Lithic Ustorthents
Rhame	Coarse-loamy, mixed Aridic Haploborolls
Rhoades	Fine, montmorillonitic Leptic Natriborolls
Rockoa	Loamy-skeletal, mixed Typic Eutroboralfs
Sage	Fine, montmorillonitic, nonacid, mesic Typic Fluvaquents
Savage	Fine, montmorillonitic Typic Argiborolls
Shambo	Fine-loamy, mixed Typic Haploborolls
Slimbutte	Loamy-skeletal, mixed Typic Haploborolls
Swanboy	Very fine, montmorillonitic, mesic Typic Torrerts
Tanna	Fine, montmorillonitic Aridic Argiborolls
Trey	Mixed, frigid Ustic Torripsamments
Twilight	Coarse-loamy, mixed Borollic Camborthids
Twotop	Very fine, montmorillonitic, mesic Typic Torrerts
*Vanocker	Loamy-skeletal, mixed Typic Eutroboralfs
Vebar	Coarse-loamy, mixed Typic Haploborolls
Watrous	Fine-loamy, mixed Typic Argiborolls
Werner	Loamy, mixed, shallow Entic Haploborolls
Winler	Very fine, montmorillonitic, mesic Typic Torrerts
Zeona	Mixed, frigid Ustic Torripsamments

Interpretive Groups

INTERPRETIVE GROUPS

(Dashes indicate that the soil was not assigned to the interpretive group)

Soil name and map symbol	Land capability	Range site	Windbreak suitability group*
AaA: Amor	IIc-2	Silty	6R
AaB: Amor	IIe-1	Silty	6R
AcC:			
Amor	IIIe-2	Silty	6R
Cabba	VIe-11	Shallow	10
AdC:			
Amor	IIIe-2	Silty	6R
Rhoades	VIs-1	Thin Claypan	10
AeB:			
Amor	IIe-1	Silty	6R
Werner	VIe-11	Shallow	10
AkA:			
Archin	IVe-12	Claypan	9
Bullock	VIs-3	Thin Claypan	10
Ar: Arnegard	IIc-3	Loamy Overflow	1
AsA: Assinniboine	IIIe-4	Sandy	5
AsB: Assinniboine	IVe-6	Sandy	5
AtA:			
Assinniboine	IIIe-4	Sandy	5
Archin	IVe-12	Claypan	9
AwB: Attewan	IVe-2	Silty	6G
Ba: Badlands	VIIIs-2	---	---
BeC: Boxwell	IVe-1	Silty	6R
BkF: Bullock	VIIs-6	Thin Claypan	10
BnA:			
Bullock	VIs-3	Thin Claypan	10
Assinniboine	IIIe-4	Sandy	5
BoD:			
Bullock	VIs-3	Thin Claypan	10
Cabbart	VIe-11	Shallow	10
BpB:			
Bullock	VIs-3	Thin Claypan	10
Parchin	IVe-12	Claypan	9
Slickspots	VIIIs-3	---	---

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Range site	Windbreak suitability group*
BsA:			
Bullock	VIs-3	Thin Claypan	10
Slickspots	VIIIs-3	---	---
CaD:			
Cabba	VIe-11	Shallow	10
Lantry	VIe-11	Thin Upland	10
Amor	VIe-11	Silty	6R
CbD:			
Cabba	VIe-11	Shallow	10
Reeder	VIe-11	Silty	6R
CcE Cabbart	VIIs-6	Shallow	10
CdE:			
Cabbart	VIIe-4	Shallow	10
Delridge	VIIe-4	Thin Upland	10
CeE:			
Cabbart	VIIe-4	Shallow	10
Rock outcrop	VIIIs-1	---	---
ChA Chinook	IIIe-4	Sandy	5
CnA:			
Chinook	IIIe-4	Sandy	5
Archin	IVe-12	Claypan	9
CoE Cohagen	VIIe-4	Shallow	10
CrF:			
Cohagen	VIIe-4	Shallow	10
Rock outcrop	VIIIs-1	---	---
Cabba Variant	VIIs-1	Shallow	10
DcC:			
Delridge	VIe-3	Thin Upland	10
Cabbart	VIe-3	Shallow	10
Du Dumps	VIIIs-1	---	---
Dw Dune land	VIIIe-2	---	---
EaA Eapa	IIIc-1	Silty	3
EcA:			
Eapa	IIIc-1	Silty	3
Archin	IVe-12	Claypan	9
FaB Farnuf	IIe-1	Silty	3
FtE:			
Fleak	VIIe-3	Shallow	10
Trey	VIIe-3	Sands	10
Rock outcrop	VIIIs-1	---	---
GdA Gerdrum	IVs-2	Claypan	9

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Range site	Windbreak suitability group*
Ge	IIIe-4	Loamy Terrace	1
Glendive			
GhB:			
Glendive	IVe-6	Sandy	5
Archin	IVe-12	Claypan	9
GkA	IIc-3	Loamy Overflow	1
Grail			
GrA:			
Grail	IIc-3	Loamy Overflow	1
Daglum	IVs-2	Claypan	9
Ha	VIe-8	Sandy	7
Hanly			
Hb	VIe-8	Sands	7
Hanly			
Hd:			
Hanly	VIe-8	Sands	7
Dogiecreek	VIIs-9	Saline Lowland	10
He:			
Hanly	VIe-8	Sands	7
Slickspots	VIIIs-3	---	---
Hf	VIw-1	Clayey Overflow	1
Harlem			
Hg	IIIc-2	Loamy Terrace	1
Havre			
Hh:			
Havre	IIIc-2	Loamy Terrace	1
Harlem	IIIc-2	Clayey Overflow	1
Hk	VIs-1	Closed Depression	10
Heil			
HsB:			
Hisle	VIs-3	Thin Claypan	10
Slickspots	VIIIs-3	---	---
KcF:			
Kirby	VIIs-6	Very Shallow	10
Cabbart	VIIe-4	Shallow	10
Rock outcrop	VIIIs-1	---	---
Ke	IIc-1	Loamy Overflow	1
Korchea			
Kg	VIw-1	Loamy Overflow	1
Korchea			
Km:			
Korchea	IIc-1	Loamy Overflow	1
Archin	IVe-12	Claypan	9
KoA	IIIc-1	Silty	3
Kremlin			
KrA:			
Kremlin	IIIc-1	Silty	3
Archin	IVe-12	Claypan	9

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Range site	Windbreak suitability group*
KyB: Kyle	IVe-3	Clayey	4C
Le: Lallie	Vw-1	Clayey Overflow	10
LhD:			
Lismas	VIe-12	Shallow Dense Clay	10
Hisle	VIs-3	Thin Claypan	10
LkD:			
Lismas	VIe-12	Shallow Dense Clay	10
Winler	VIe-4	Dense Clay	10
LrF:			
Lismas	VIIe-5	Shallow Dense Clay	10
Rock outcrop	VIIIs-1	---	---
MaB: Marmarth	IIIe-1	Silty	6R
McC:			
Marmarth	IVe-1	Silty	6R
Cabbart	VIe-11	Shallow	10
MpB:			
Marmarth	IIIe-1	Silty	6R
Parchin	IVe-12	Claypan	9
MtC:			
Marmarth	IVe-1	Silty	6R
Twilight	IVe-7	Sandy	6R
MtD:			
Marmarth	VIe-7	Silty	6R
Twilight	VIe-7	Sandy	6R
NaD:			
Nihill Variant	VIIs-7	Thin Upland	10
Attewan	VIe-2	Silty	6G
PbB:			
Parchin	IVe-12	Claypan	9
Bullock	VIs-3	Thin Claypan	10
PhA: Parshall	IIIe-7	Sandy	5
Pt: Pits	VIIIs-2	---	---
RbB: Reeder	IIe-1	Silty	6R
RcC:			
Reeder	IIIe-2	Silty	6R
Cabba	VIe-11	Shallow	10
ReB:			
Reeder	IIe-1	Silty	6R
Rhoades	VIs-1	Thin Claypan	10
RfE:			
Reva	VIIe-7	Shallow	10
Slimbutte	VIIe-7	Stony Hills	10

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Range site	Windbreak suitability group*
RgE:			
Reva	VIIe-7	Shallow	10
Rock outcrop	VIIIs-1	---	---
RhB	IVe-6	Sandy	6R
Rhame			
RmB:			
Rhame	IVe-6	Sandy	6R
Parchin	IVe-12	Claypan	9
RnA:			
Rhoades	VIs-1	Thin Claypan	10
Daglum	IVs-2	Claypan	9
RnB:			
Rhoades	VIs-1	Thin Claypan	10
Daglum	VIe-9	Claypan	10
RoF	VIIIs-1	---	---
Rock outcrop			
RrF:			
Rock outcrop	VIIIs-1	---	---
Reva	VIIe-7	Shallow	10
RsF:			
Rockoa**	VIIe-9	---	10
Reva	VIIe-7	Shallow	10
SaA	VIIs-9	Saline Lowland	10
Sage			
SbA:			
Sage	VIIs-9	Saline Lowland	10
Hisle Variant	VIw-4	Saline Lowland	10
SgA	IIc-2	Clayey	3
Savage			
ShB	IIe-1	Silty	3
Shambo			
SmB:			
Shambo	IIe-1	Silty	3
Rhoades	VIs-1	Thin Claypan	10
Sn	VIIIs-3	---	---
Slickspots			
SpC:			
Slimbutte	VIe-1	Stony Hills	10
Arnegard	IIe-1	Silty	1
Reva	VIe-11	Shallow	10
SrE:			
Slimbutte	VIIe-9	Stony Hills	10
Reva	VIIe-9	Shallow	10
SwA	VIs-6	Dense Clay	10
Swanboy			
SyA:			
Swanboy	VIs-6	Dense Clay	10
Slickspots	VIIIs-3	---	---

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Range site	Windbreak suitability group*
TnB------ Tanna	IVe-3	Clayey------	4L
ToA:			
Tanna------	IIIs-1	Clayey------	4L
Gerdrum------	IVs-2	Claypan------	9
ToC:			
Tanna------	IVe-3	Clayey------	4L
Rhoades------	VIs-1	Thin Claypan------	10
TrB------ Trey	VIe-10	Sands------	7
TtC:			
Trey------	VIe-10	Sands------	7
Fleak------	VIe-9	Shallow------	10
TvB:			
Trey------	VIe-10	Sands------	7
Parchin------	IVe-12	Sandy------	9
Bullock------	VIs-3	Thin Claypan------	10
TwC------ Twilight	IVe-7	Sandy------	6R
TxE:			
Twilight------	VIe-7	Sandy------	6R
Blackhall------	VIe-11	Shallow------	10
TyC:			
Twilight------	VIe-7	Sandy------	6R
Parchin------	VIe-5	Sandy------	9
TzA------ Twotop	VIs-6	Dense Clay------	10
VaF:			
Vanocker**------	VIIe-9	---	10
Reva------	VIIe-7	Shallow------	10
VbB------ Vebar	IIIe-8	Sandy------	6R
VcC:			
Vebar------	IVe-8	Sandy------	6R
Cohagen------	VIe-10	Shallow------	10
VcD:			
Vebar------	VIe-6	Sandy------	6R
Cohagen------	VIe-10	Shallow------	10
WaB:			
Watrous------	IIe-1	Silty------	6R
Werner------	VIe-11	Shallow------	10
WbB:			
Watrous------	IIe-1	Silty------	6R
Rhoades------	VIs-1	Thin Claypan------	10
WdC:			
Werner------	VIe-11	Shallow------	10
Reva------	VIe-11	Shallow------	10

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability	Range site	Windbreak suitability group*
WeC:			
Werner	VIe-11	Shallow	10
Watrous	IIe-1	Silty	6R
WhB:			
Winler	VIs-6	Dense Clay	10
Hisle	VIs-3	Thin Claypan	10
WsC:			
Winler	VIe-4	Dense Clay	10
Lismas	VIe-4	Shallow Dense Clay	10
ZaB Zeona	VIe-10	Sands	7
ZaD Zeona	VIIe-3	Sands	10
ZbC:			
Zeona	VIe-10	Sands	7
Blownout land	VIIIs-1	---	---
ZpB:			
Zeona	VIe-10	Sands	7
Parchin	IVe-12	Sandy	9

* Soils in windbreak suitability group 10 are unsuited to windbreaks.
** This soil is assigned to the Cool Slopes grazable woodland group.

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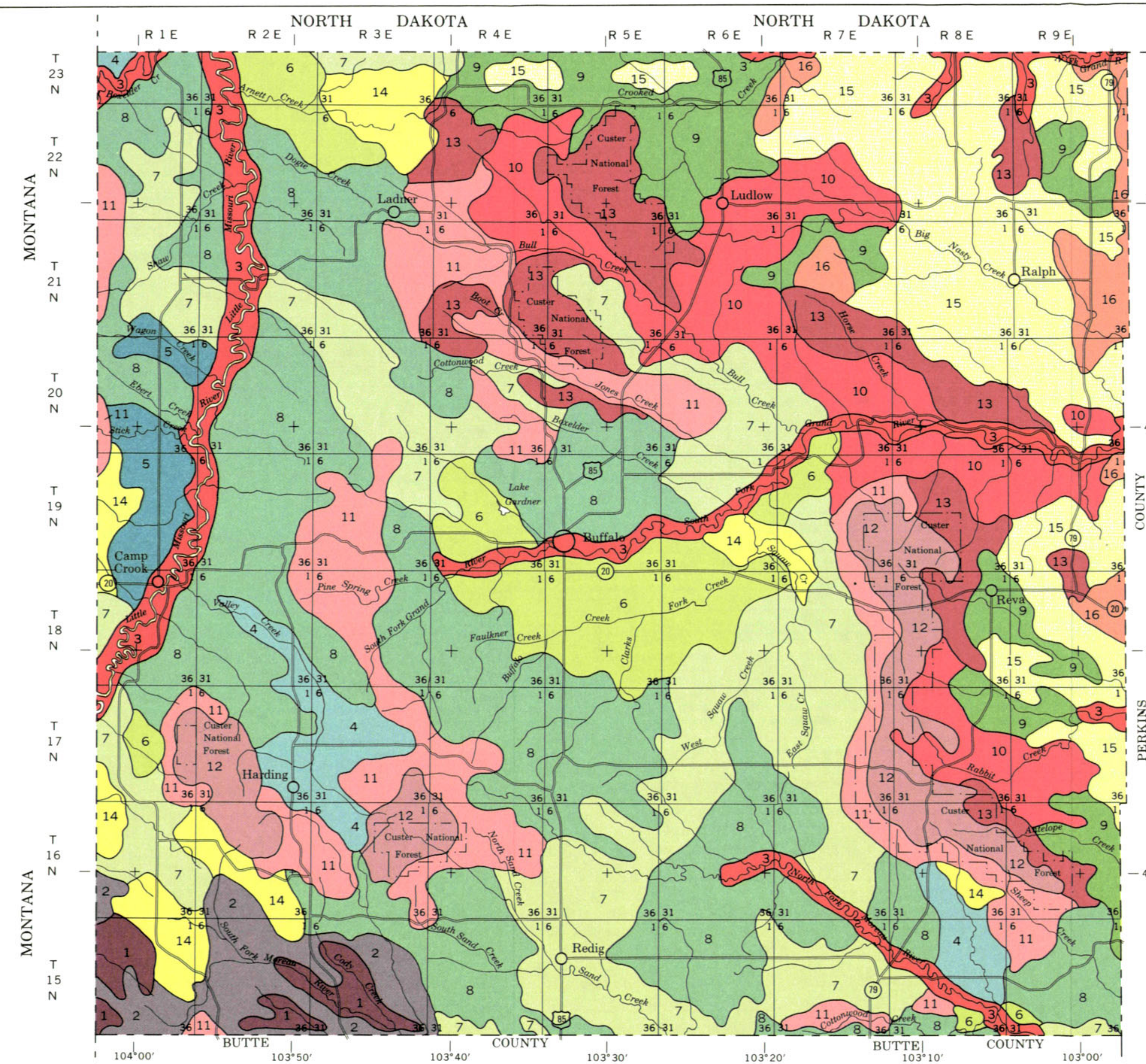

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND*

NEARLY LEVEL TO VERY STEEP, CLAYEY SOILS ON UPLANDS, TERRACES, AND FOOT SLOPES

1 Swanboy association: Deep, well drained, nearly level to moderately sloping, clayey soils on foot slopes and terraces

2 Lismas-Winler association: Shallow and moderately deep, well drained, gently sloping to very steep, clayey soils on uplands

NEARLY LEVEL, SANDY AND LOAMY SOILS ON FLOOD PLAINS

3 Hanly-Korchea-Glendive association: Deep, somewhat excessively drained and well drained, nearly level, sandy and loamy soils on flood plains

NEARLY LEVEL TO GENTLY SLOPING, LOAMY SOILS ON TERRACES, FANS, AND UPLANDS

4 Chinook-Archin-Assinniboine association: Deep, well drained, nearly level to gently sloping, loamy soils on terraces, fans, and uplands

5 Archin-Kremlin-Bullock association: Deep, well drained, nearly level and very gently sloping, loamy soils on terraces, fans, and uplands

NEARLY LEVEL TO VERY STEEP, LOAMY AND SANDY SOILS ON UPLANDS

6 Zeona-Trey association: Deep and moderately deep, excessively drained and well drained, undulating to hilly, sandy soils on uplands

7 Bullock-Parchin association: Moderately deep, well drained, nearly level to gently sloping, loamy soils on uplands

8 Twilight-Parchin-Cabbart association: Moderately deep and shallow, well drained, gently sloping to very steep, loamy soils on uplands

9 Reeder-Rhoades association: Moderately deep, well drained, nearly level to strongly sloping, loamy soils on uplands

ROCK OUTCROP AND NEARLY LEVEL TO VERY STEEP, LOAMY AND GRAVELLY SOILS ON UPLANDS

10 Cabba-Amor-Rhoades association: Shallow and moderately deep, well drained, nearly level to moderately steep, loamy soils on uplands

11 Cabbart-Rock outcrop-Delridge association: Rock outcrop and shallow and moderately deep, well drained, moderately sloping to very steep, loamy soils on uplands

12 Reva-Rockoa association: Shallow and deep, well drained, moderately sloping to very steep, gravelly and loamy soils on uplands

13 Cohagen-Rock outcrop association: Rock outcrop and shallow, well drained, moderately sloping to very steep, loamy soils on uplands

NEARLY LEVEL TO VERY STEEP, LOAMY SOILS ON UPLANDS

14 Marmarth-Twilight-Cabbart association: Moderately deep and shallow, well drained, gently sloping to very steep, loamy soils on uplands

15 Amor-Cabba association: Moderately deep and shallow, well drained, nearly level to moderately steep, loamy soils on uplands

16 Vebar-Cohagen association: Moderately deep and shallow, well drained, gently sloping to moderately steep, loamy soils on uplands

*The texture terms in the descriptive headings refer to the surface layer of the major soils in each association.

COMPILED 1986

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
HARDING COUNTY, SOUTH DAKOTA

Scale 1:380,160

1 0 1 2 3 4 5 6 Miles

1 0 6 12 Km

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
HARDING COUNTY, SOUTH DAKOTA

Scale 1:380,160

1 0 1 2 3 4 5 6 Miles

1 0 6 12 Km

SOIL LEGEND

Map symbols consist of a combination of letters. The first capital letter is the initial one of the map unit name. The lowercase letter that follows, separates map units having names that begin with the same letter, except that it does not separate sloping phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
AaA	Amor loam, 0 to 2 percent slopes
AaB	Amor loam, 2 to 6 percent slopes
AcC	Amor-Cabba loams, 6 to 9 percent slopes
AdC	Amor-Rhoades loams, 6 to 9 percent slopes
AeB	Amor-Werner loams, 2 to 6 percent slopes
AkA	Archin-Bullock fine sandy loams, 0 to 4 percent slopes
Ar	Arnegard loam
AsA	Assinniboine fine sandy loam, 0 to 3 percent slopes
AsB	Assinniboine fine sandy loam, 3 to 6 percent slopes
AtA	Assinniboine-Archin fine sandy loams, 0 to 3 percent slopes
AwB	Attewan loam, 2 to 6 percent slopes
Ba	Badlands
BeC	Boxwell loam, 6 to 9 percent slopes
BkF	Bullock fine sandy loam, 6 to 20 percent slopes, extremely stony
BnA	Bullock-Assinniboine fine sandy loams, 0 to 4 percent slopes
BoD	Bullock-Cabbart complex, 6 to 25 percent slopes
BpB	Bullock-Parchin-Slickspots complex, 2 to 9 percent slopes
BsA	Bullock-Slickspots complex, 0 to 4 percent slopes
CaD	Cabba-Lantry-Amor loams, 9 to 25 percent slopes
CbD	Cabba-Reeder loams, 9 to 25 percent slopes
CcE	Cabbart loam, 6 to 60 percent slopes, extremely stony
CdE	Cabbart-Delridge loams, 15 to 40 percent slopes
CeE	Cabbart-Rock outcrop complex, 15 to 40 percent slopes
ChA	Chinook fine sandy loam, 0 to 3 percent slopes
CnA	Chinook-Archin fine sandy loams, 0 to 3 percent slopes
CoE	Cohagen fine sandy loam, 15 to 50 percent slopes
CrF	Cohagen-Rock outcrop-Cabba Variant complex, 3 to 100 percent slopes
DcC	Delridge-Cabbart loams, 6 to 15 percent slopes
Du	Dumps, mine
Dw	Dune land
EaA	Eapa loam, 0 to 3 percent slopes
EcA	Eapa-Archin complex, 0 to 3 percent slopes
FaB	Farnuf loam, 2 to 6 percent slopes
FtE	Fleak-Trey-Rock outcrop complex, 15 to 50 percent slopes
GdA	Gerdrum silt loam, 0 to 4 percent slopes
Ge	Glendive fine sandy loam
GhB	Glendive-Archin fine sandy loams, 2 to 6 percent slopes
GkA	Grail silt loam, 0 to 3 percent slopes
GrA	Grail-Daglum complex, 0 to 3 percent slopes
Ha	Hanly fine sandy loam
Hb	Hanly loamy fine sand
Hd	Hanly-Dogiecreek fine sandy loams
He	Hanly-Slickspots complex
Hf	Harlem silty clay, channeled
Hg	Havre loam
Hh	Havre-Harlem complex
Hk	Heil silt loam
HsB	Hisle-Slickspots complex, 0 to 6 percent slopes
KcF	Kirby-Cabbart-Rock outcrop complex, 15 to 60 percent slopes
Ke	Korchea loam
Kg	Korchea loam, channeled
Km	Korchea-Archin complex
KoA	Kremlin loam, 0 to 3 percent slopes
KrA	Kremlin-Archin complex, 0 to 3 percent slopes
KyB	Kyle clay, 2 to 6 percent slopes
Le	Lallie silty clay loam
LhD	Lismas-Hisle complex, 6 to 25 percent slopes
LkD	Lismas-Winler clays, 6 to 25 percent slopes
Lrf	Lismas-Rock outcrop complex, 15 to 60 percent slopes
MaB	Marmarth fine sandy loam, 2 to 6 percent slopes
McC	Marmarth-Cabbart complex, 6 to 9 percent slopes
MpB	Marmarth-Parchin fine sandy loams, 2 to 6 percent slopes
MtC	Marmarth-Twilight fine sandy loams, 6 to 9 percent slopes
MtD	Marmarth-Twilight fine sandy loams, 9 to 15 percent slopes
NaD	Nihill Variant-Attewan complex, 4 to 40 percent slopes
PbB	Parchin-Bullock fine sandy loams, 2 to 9 percent slopes
PhA	Parshall fine sandy loam, 0 to 3 percent slopes
Pt	Pits, gravel
RbB	Reeder loam, 2 to 6 percent slopes
RcC	Reeder-Cabba loams, 6 to 9 percent slopes
ReB	Reeder-Rhoades loams, 2 to 6 percent slopes
RfE	Reva-Slimbutte complex, 9 to 70 percent slopes
RgE	Reva-Rock outcrop complex, 15 to 70 percent slopes
RhB	Rhame fine sandy loam, 2 to 6 percent slopes
RmB	Rhame-Parchin fine sandy loams, 2 to 6 percent slopes
RnA	Rhoades-Daglum loams, 0 to 2 percent slopes
RnB	Rhoades-Daglum loams, 2 to 9 percent slopes
RoF	Rock outcrop
RrF	Rock outcrop-Reva complex, 15 to 60 percent slopes
RsF	Rockoa-Reva complex, 6 to 60 percent slopes
SaA	Sage loam
SbA	Sage-Hisle Variant complex, 0 to 2 percent slopes
SgA	Savage silty clay loam
ShB	Shambo loam, 2 to 6 percent slopes
SmB	Shambo-Rhoades loams, 2 to 6 percent slopes
Sn	Slickspots
SpC	Slimbutte-Arnegard-Reva complex, 2 to 12 percent slopes
SrE	Slimbutte-Reva complex, 6 to 60 percent slopes
SwA	Swanboy clay, 0 to 9 percent slopes
SyA	Swanboy-Slickspots complex, 0 to 2 percent slopes
TnB	Tanna silty clay loam, 2 to 9 percent slopes
ToA	Tanna-Gerdrum complex, 0 to 3 percent slopes
ToC	Tanna-Rhoades complex, 2 to 9 percent slopes
TrB	Trey loamy fine sand, 2 to 9 percent slopes
TtC	Trey-Fleak loamy fine sands, 2 to 15 percent slopes
TvB	Trey-Parchin-Bullock complex, 2 to 9 percent slopes
TwC	Twilight fine sandy loam, 6 to 9 percent slopes
TxE	Twilight-Blackhall fine sandy loams, 9 to 25 percent slopes
TyC	Twilight-Parchin fine sandy loams, 6 to 15 percent slopes
TzA	Twotop clay, 0 to 3 percent slopes
VaF	Vanocker-Reva complex, 6 to 60 percent slopes
VbB	Vebar fine sandy loam, 2 to 6 percent slopes
VcC	Vebar-Cohagen fine sandy loams, 6 to 9 percent slopes
VcD	Vebar-Cohagen fine sandy loams, 9 to 25 percent slopes
WaB	Watrous-Werner loams, 2 to 6 percent slopes
WbB	Watrous-Rhoades loams, 2 to 6 percent slopes
WdC	Werner-Reva complex, 3 to 9 percent slopes
WeC	Werner-Watrous loams, 2 to 9 percent slopes
WhB	Winler-Hisle complex, 0 to 9 percent slopes
WsC	Winler-Lismas clays, 2 to 15 percent slopes
ZaB	Zeona loamy fine sand, 2 to 9 percent slopes
ZaD	Zeona loamy fine sand, 9 to 25 percent slopes
ZbC	Zeona-Blownout land complex, 2 to 15 percent slopes
ZpB	Zeona-Parchin complex, 2 to 9 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

National, state or province

County or parish

Reservation (national forest or park, state forest or park, and large airport)

Field sheet matchline & neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield, cemetery, or flood pool

Davis Airstrip

FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

County, farm or ranch

Trail

ROAD EMBLEMS & DESIGNATIONS

Federal 410

State 52

DAMS

Medium or small water w

PITS

Gravel pit

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban areas)

Church

School

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Drainage end

LAKES, PONDS AND RESERVOIRS

Perennial water w

Intermittent int i

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS AcC BpB

DEPRESSION OR SINK

MISCELLANEOUS

Blowout

Gravelly spot

Prominent hill or peak

Rock outcrop (includes sandstone and shale)

Stony spot, very stony spot

Scoria outcrop

Clay butte

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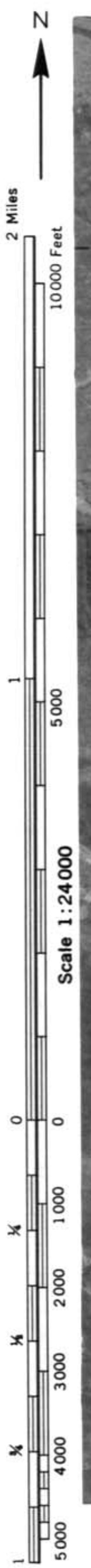
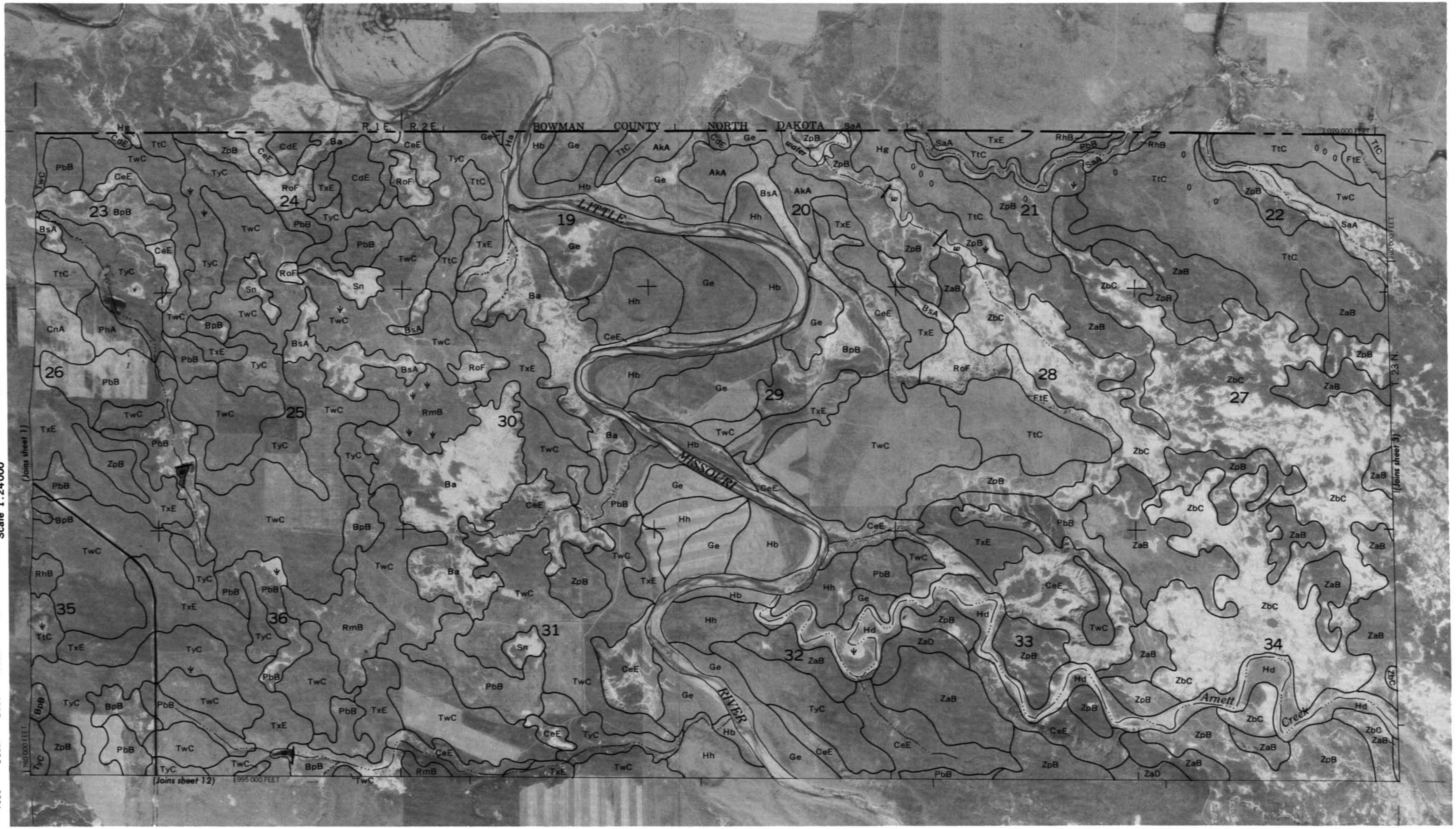
(2)





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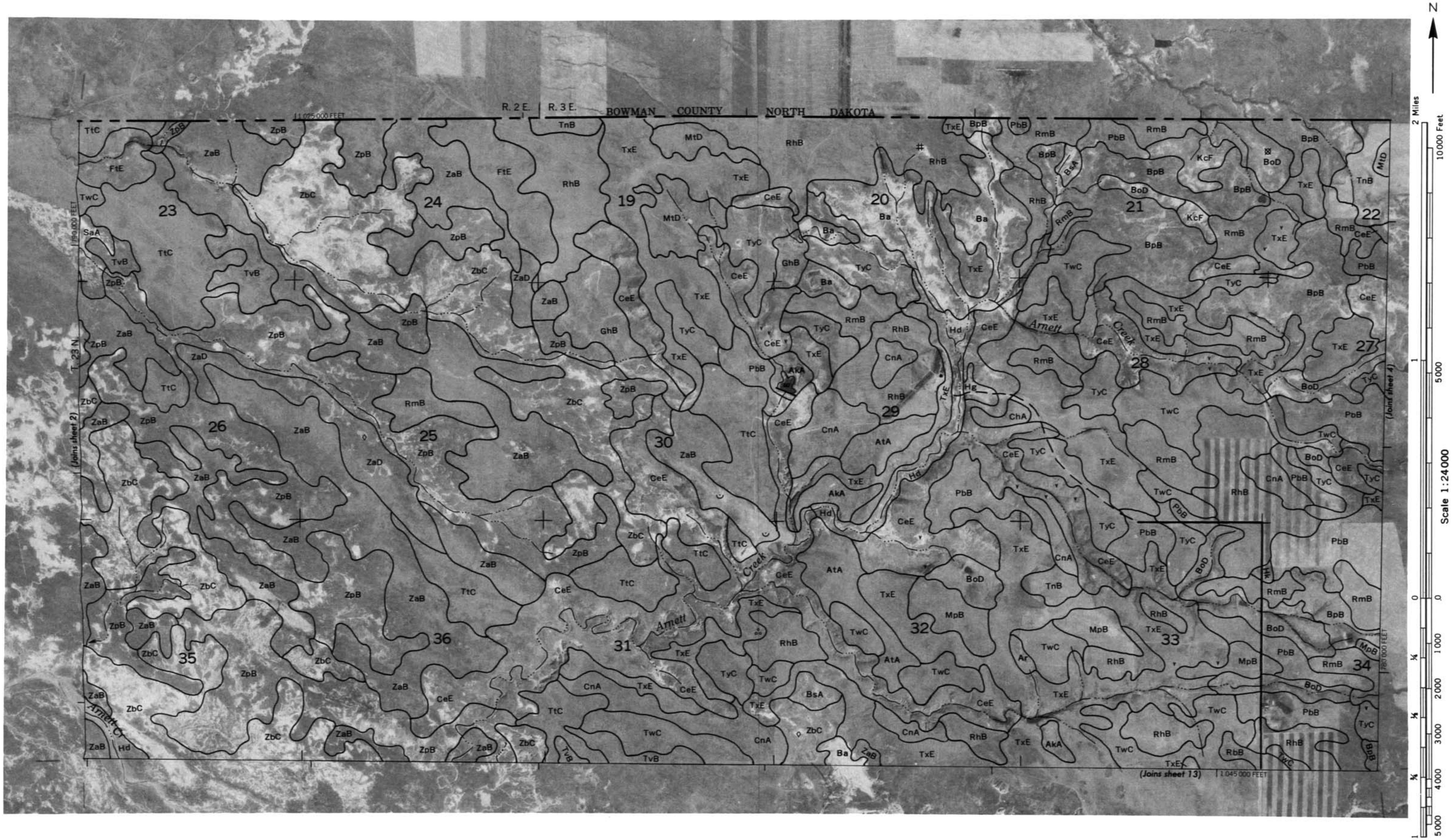
3



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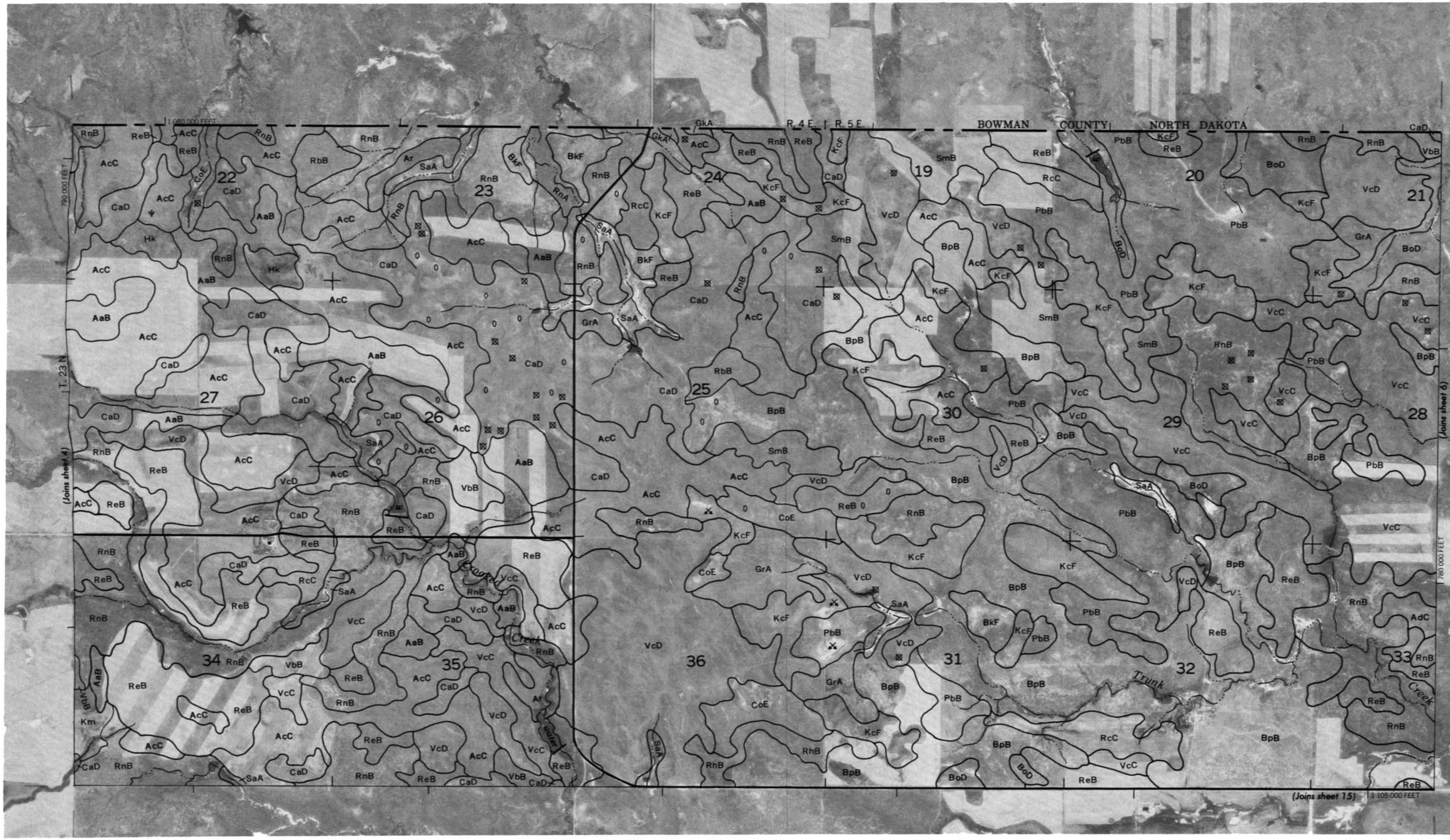
5



N

Scale 1:24 000

2 Miles
1
0
1/4
1/2
3/4
10000 Feet
5000
0
1000
2000
3000
4000
5000

HARDING COUNTY, SOUTH DAKOTA NO. 5

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HARDING COUNTY, SOUTH DAKOTA NO. 6

HARDING COUNTY, SOUTH DAKOTA NO. 7

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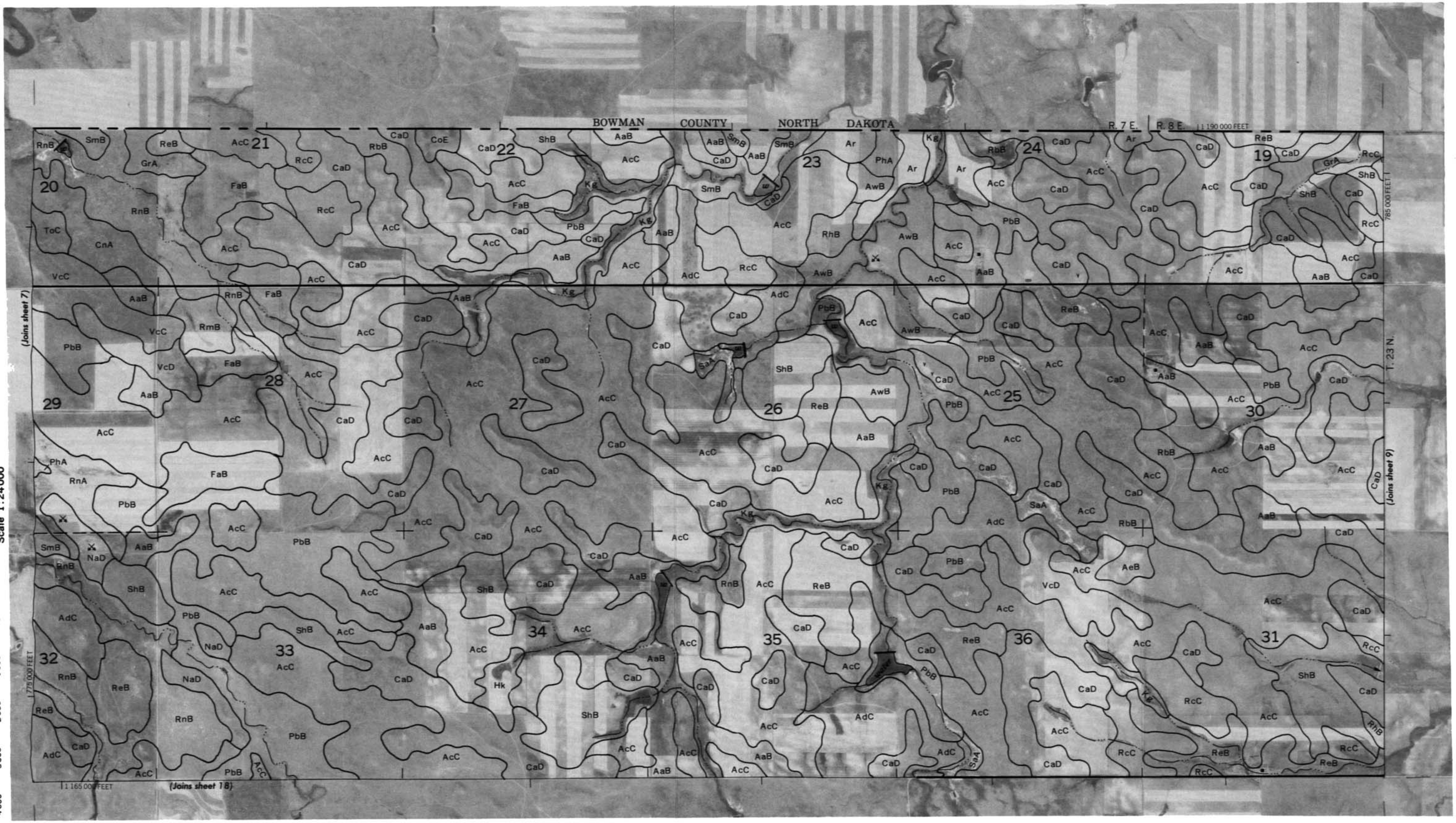
N

2 Miles

10 000 Feet

Scale 1:24000



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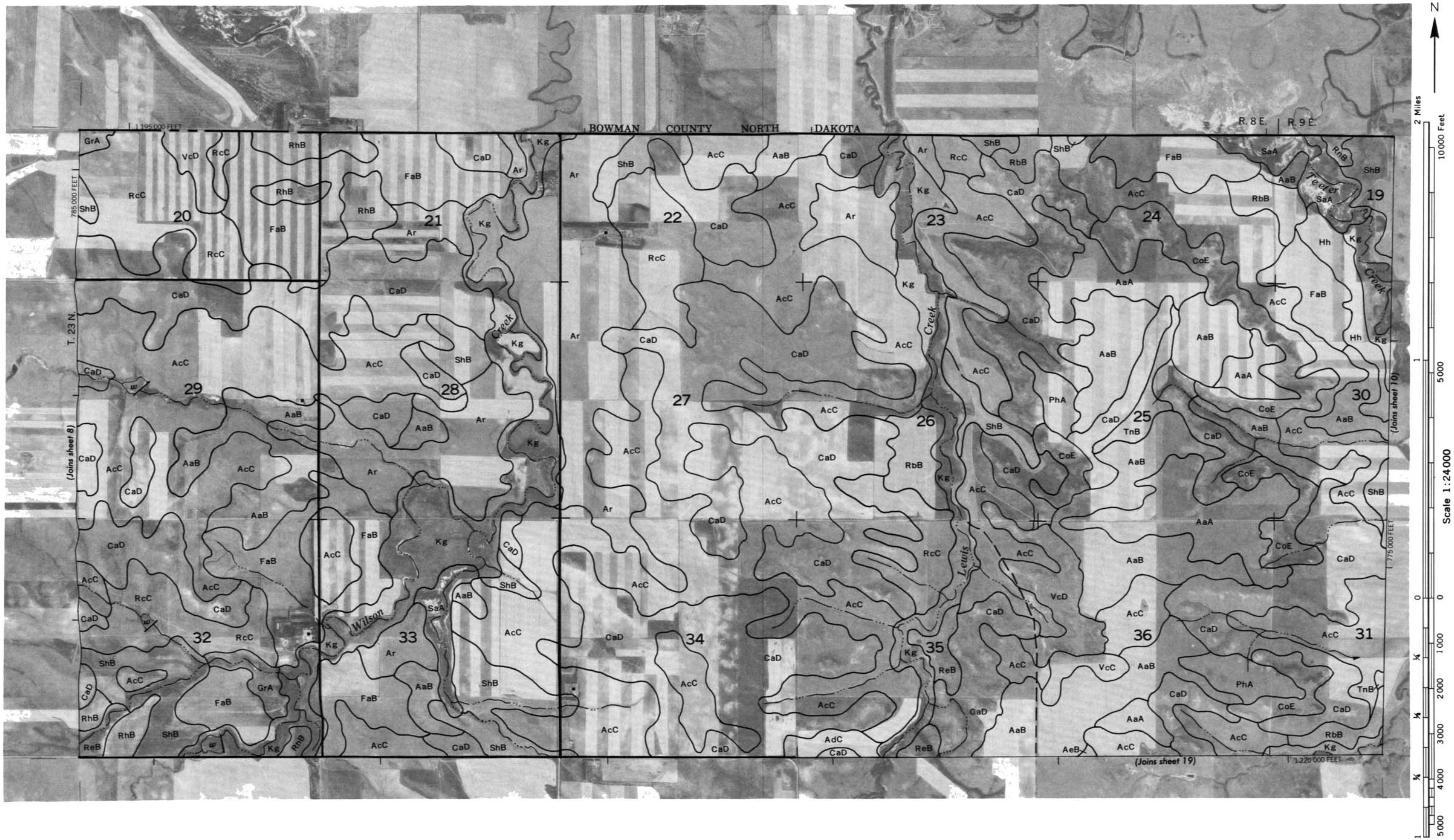

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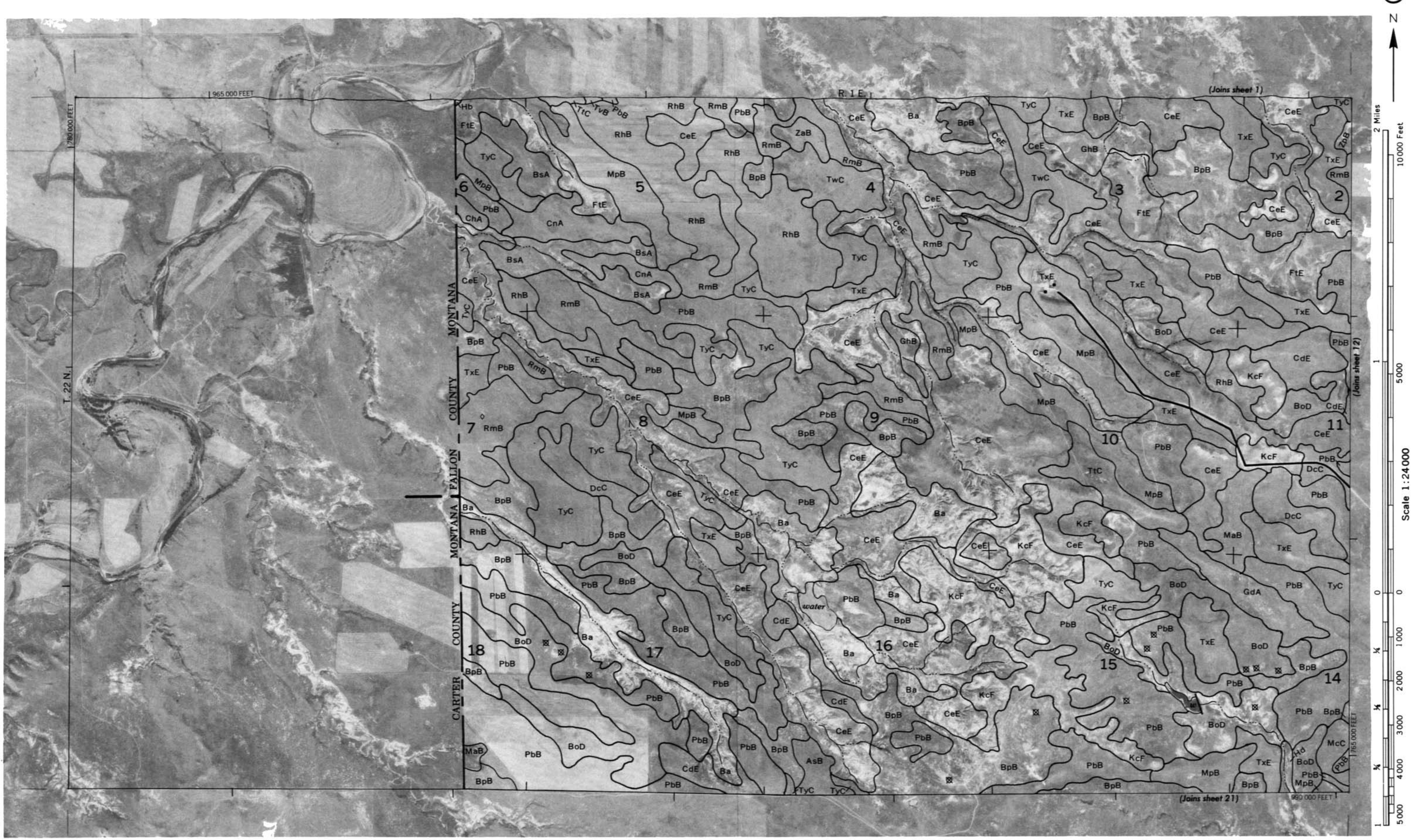

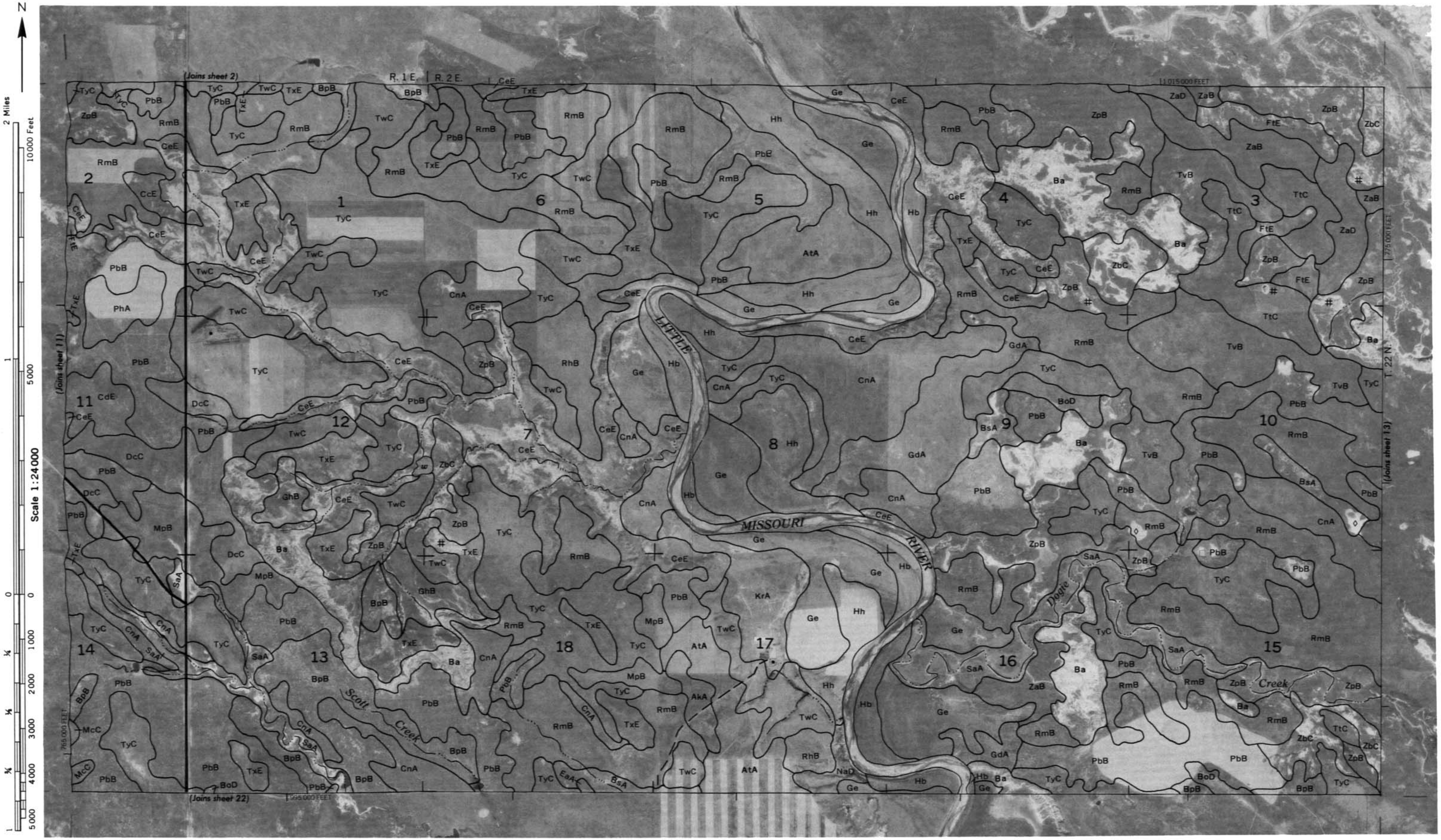

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13

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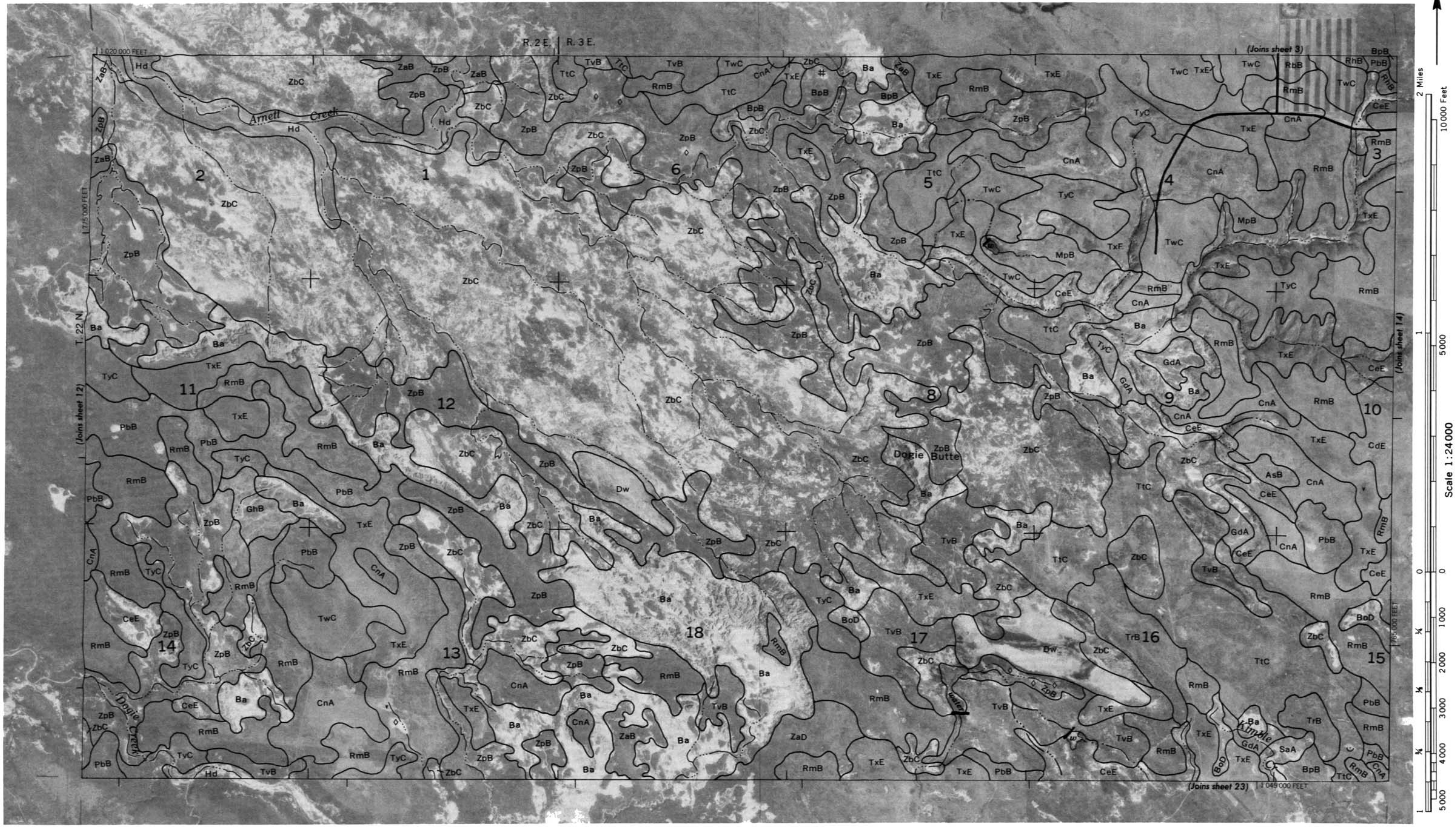

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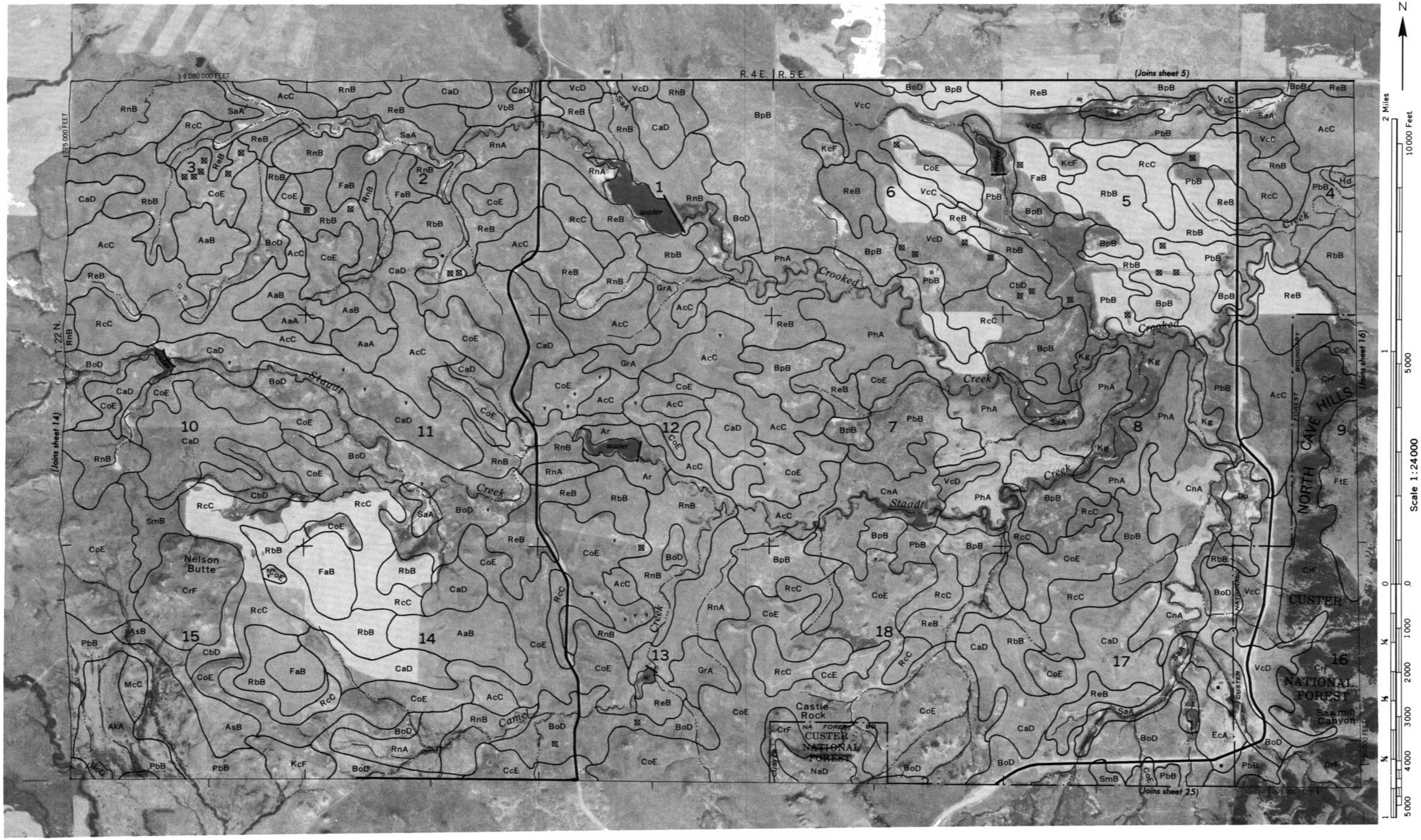

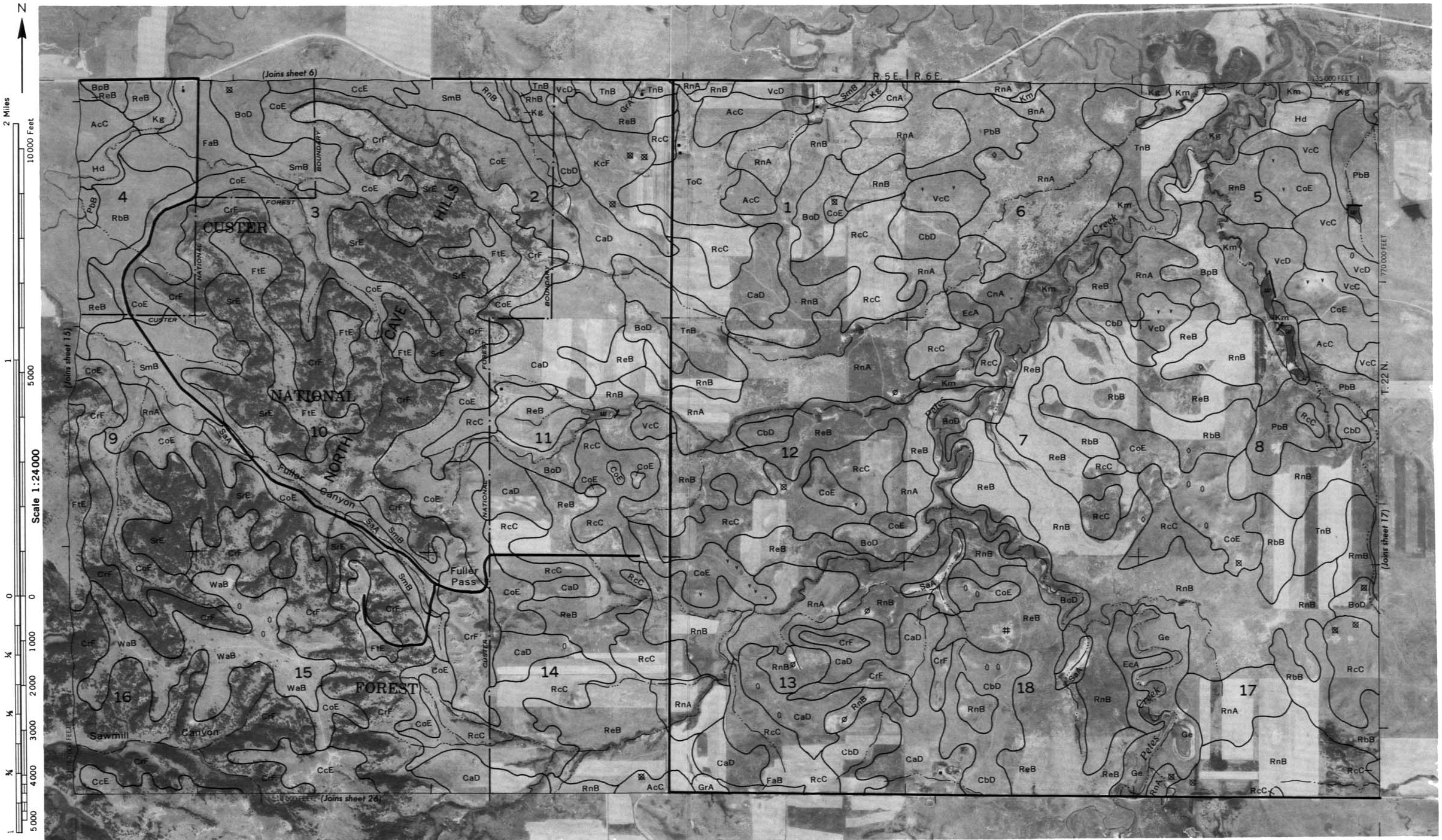

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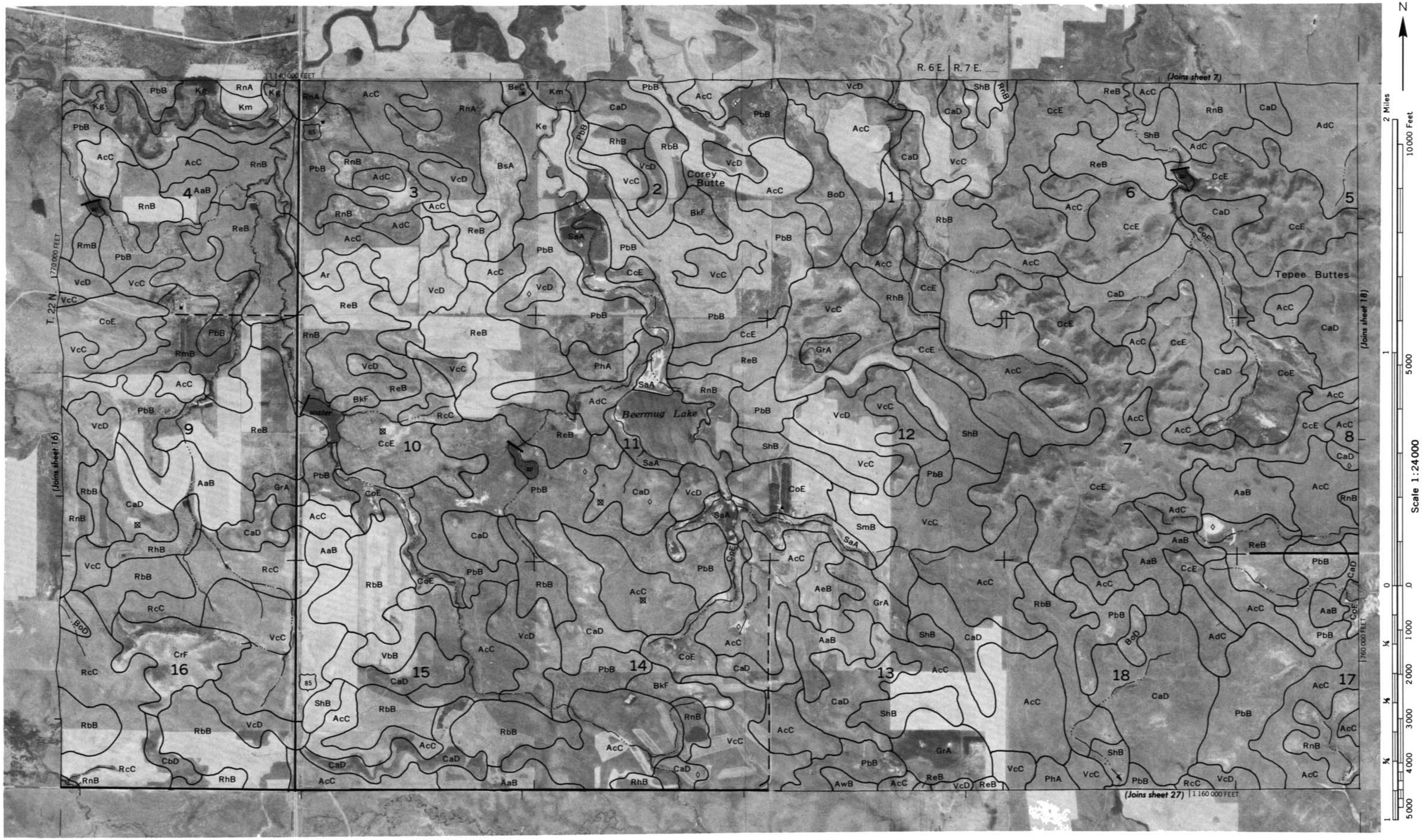
(17)



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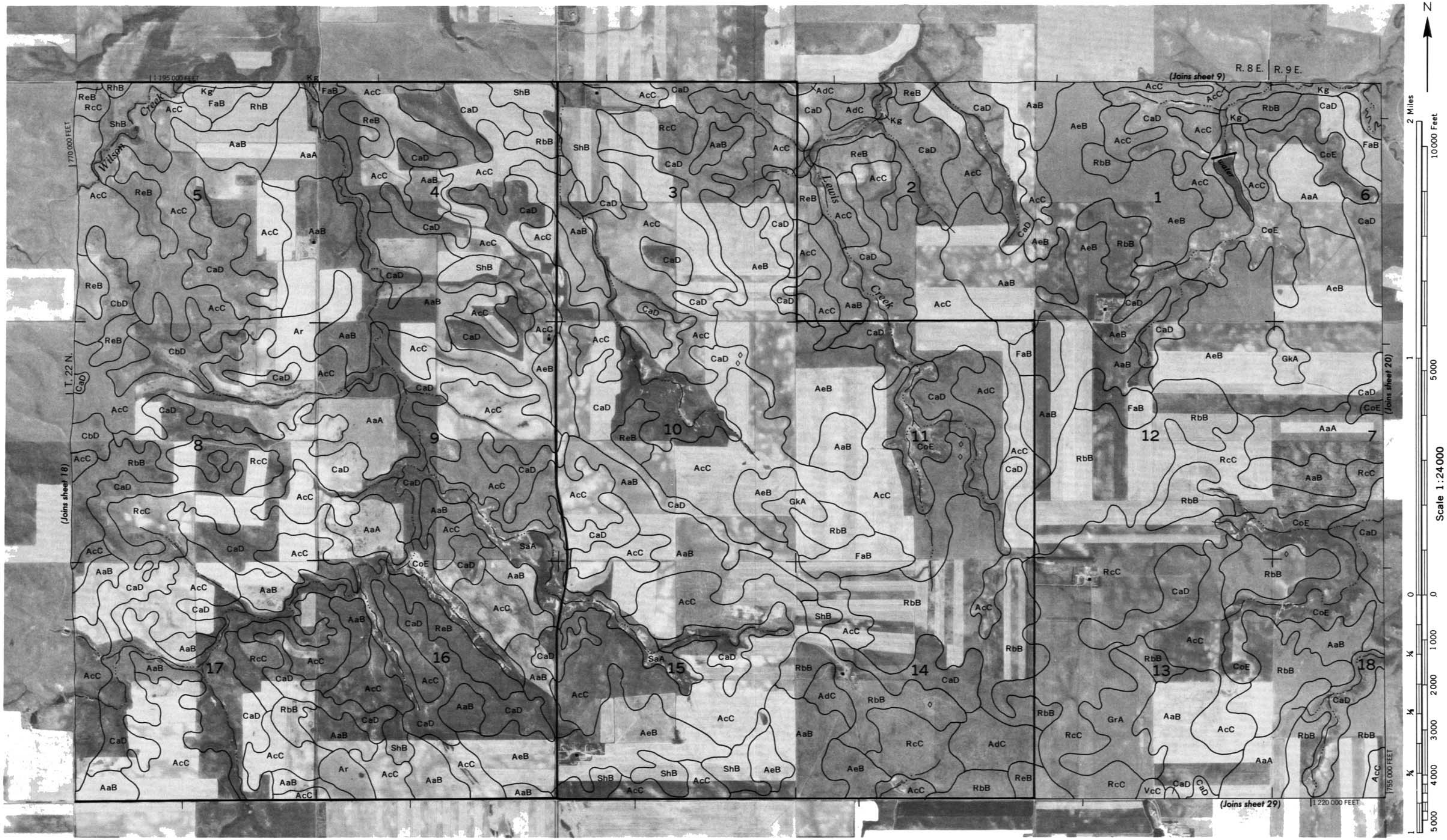
HARDING COUNTY, SOUTH DAKOTA NO. 18

(19)



HARDING COUNTY, SOUTH DAKOTA NO. 19

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N

2 Miles
10000 Feet
5000
0
1000
2000
3000
4000
5000
Scale 1:24000

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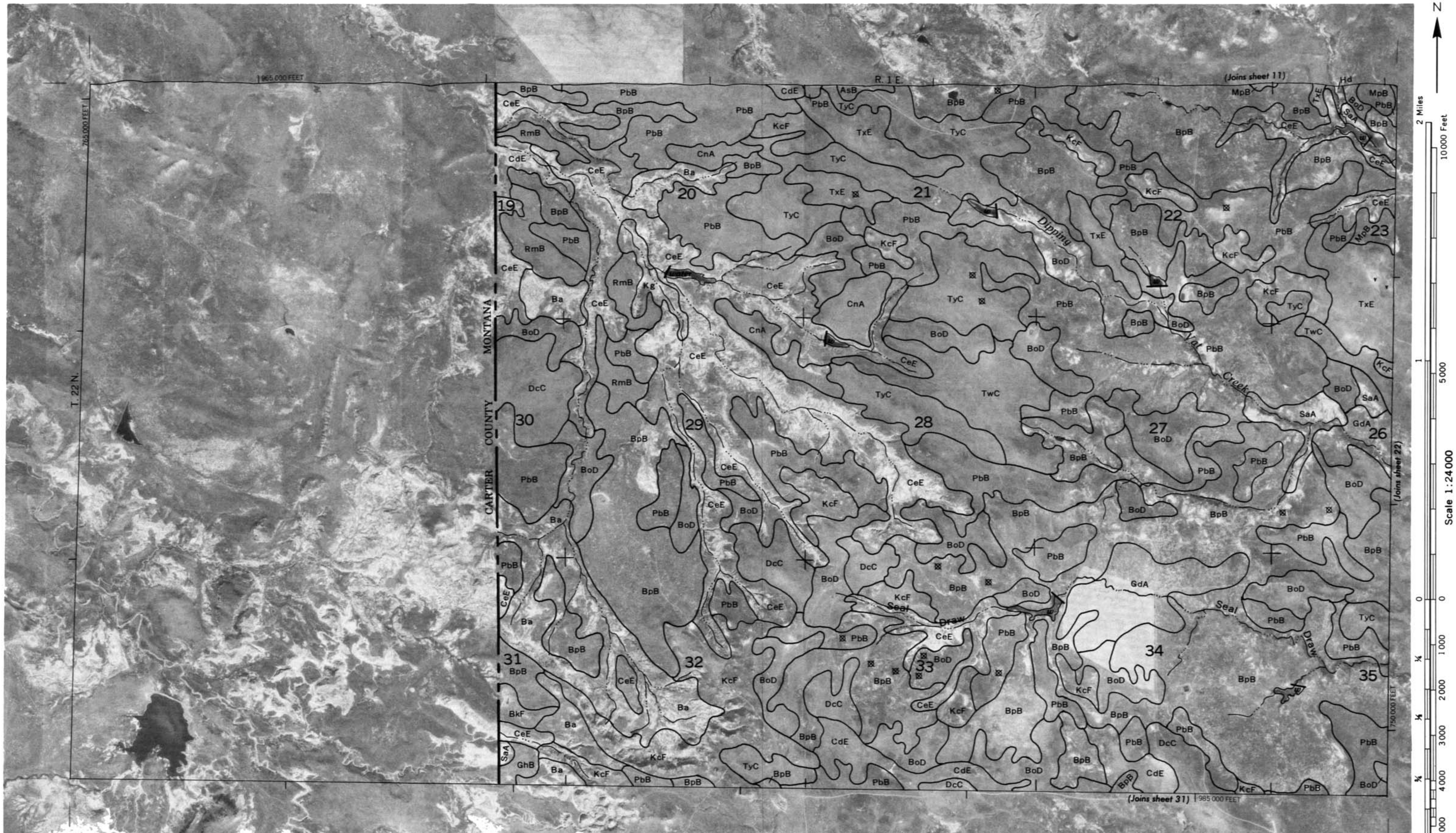
21



HARDING COUNTY, SOUTH DAKOTA NO. 21

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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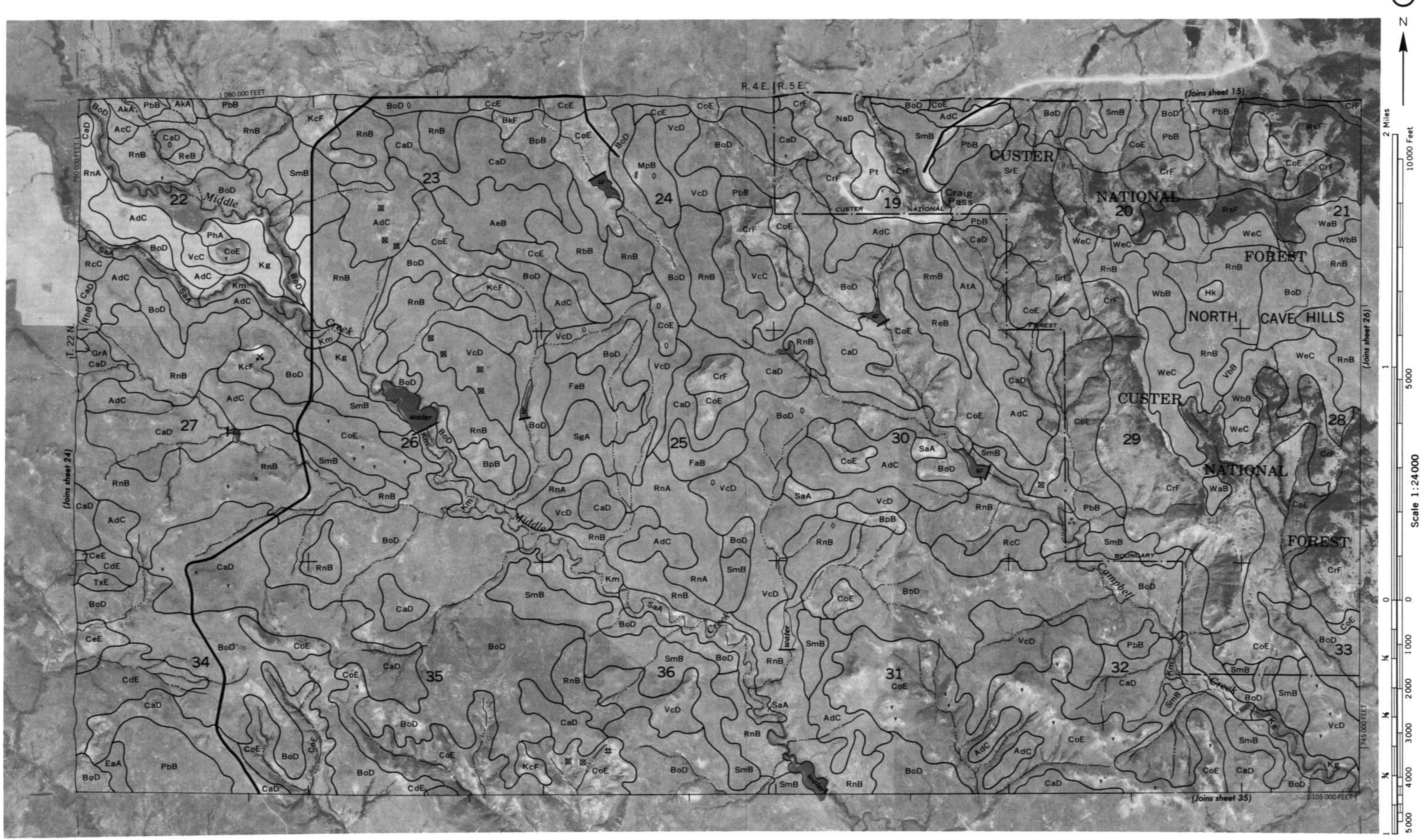
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 24



HARDING COUNTY, SOUTH DAKOTA NO. 25

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

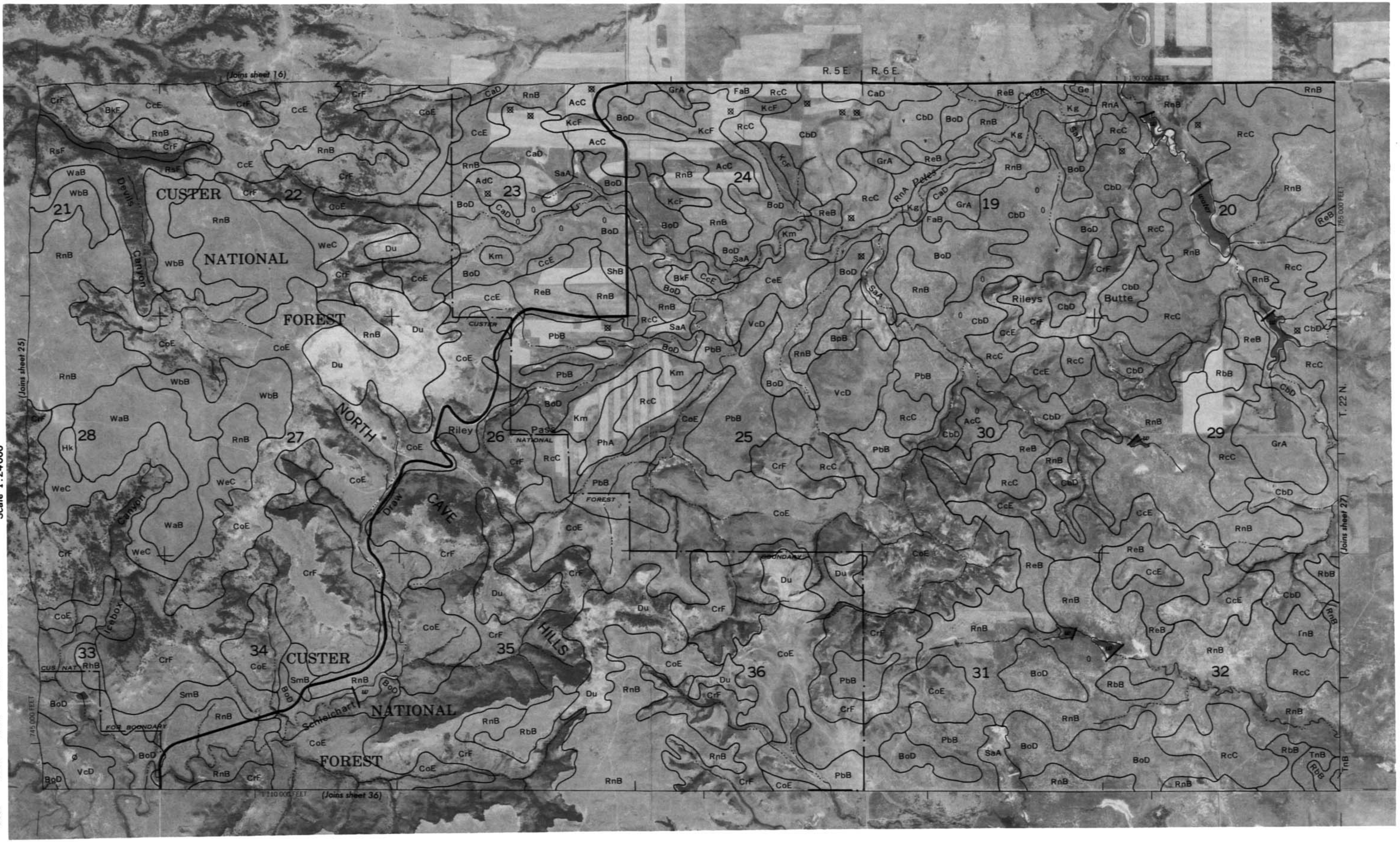
26

N

2 Miles

10 000 Feet

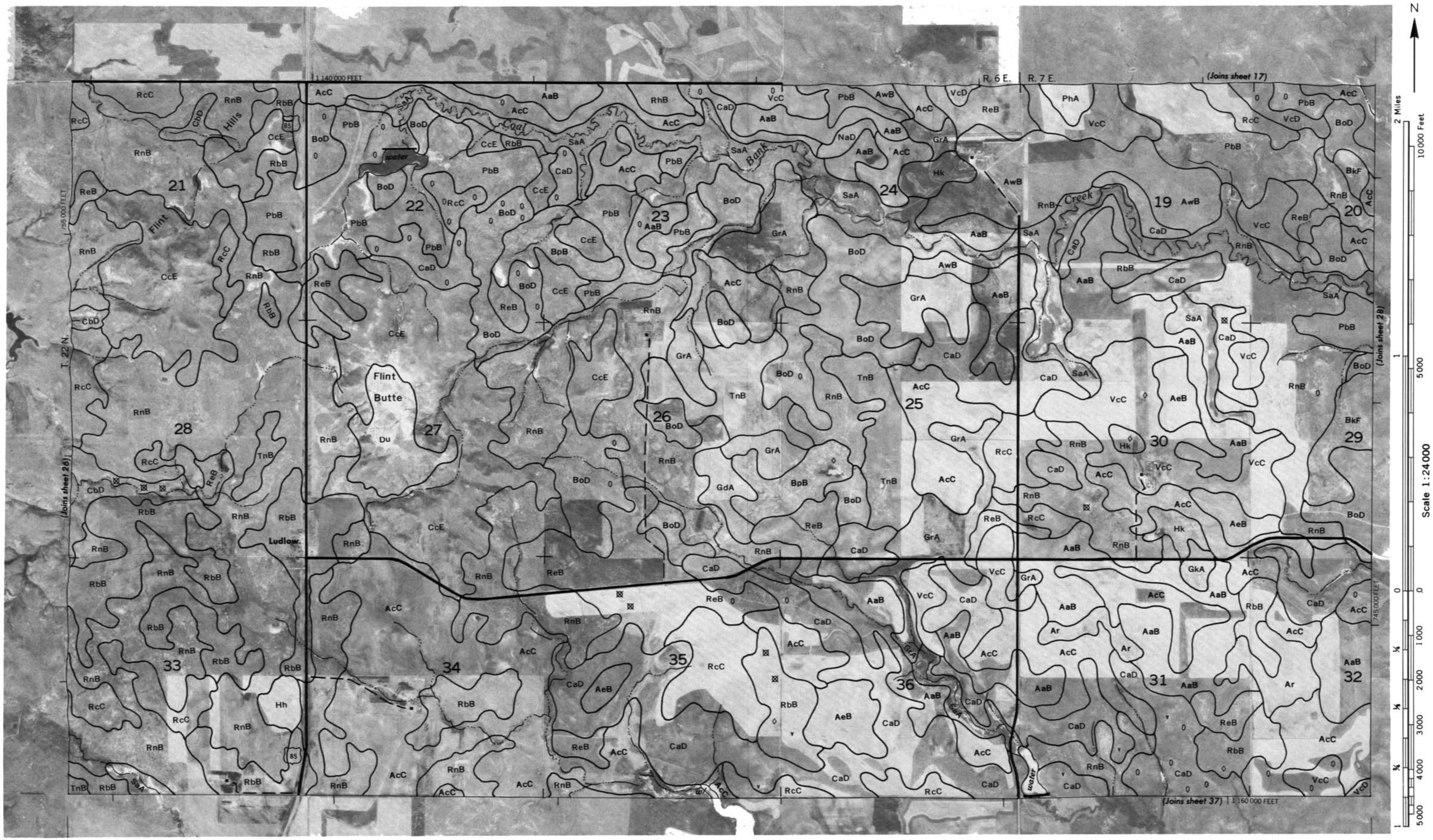
Scale 1:24 000



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 26

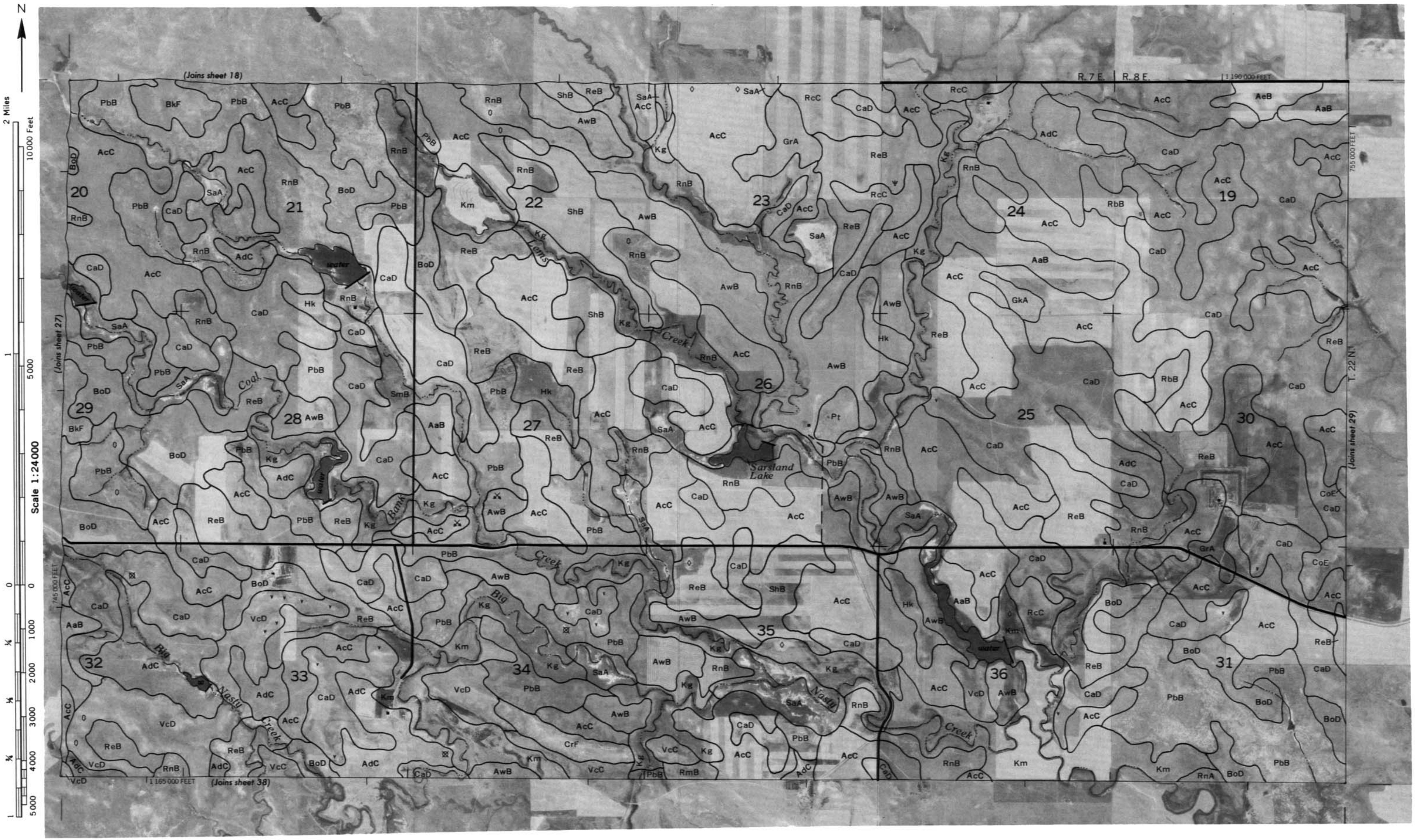
27



HARDING COUNTY, SOUTH DAKOTA NO. 27

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(28)

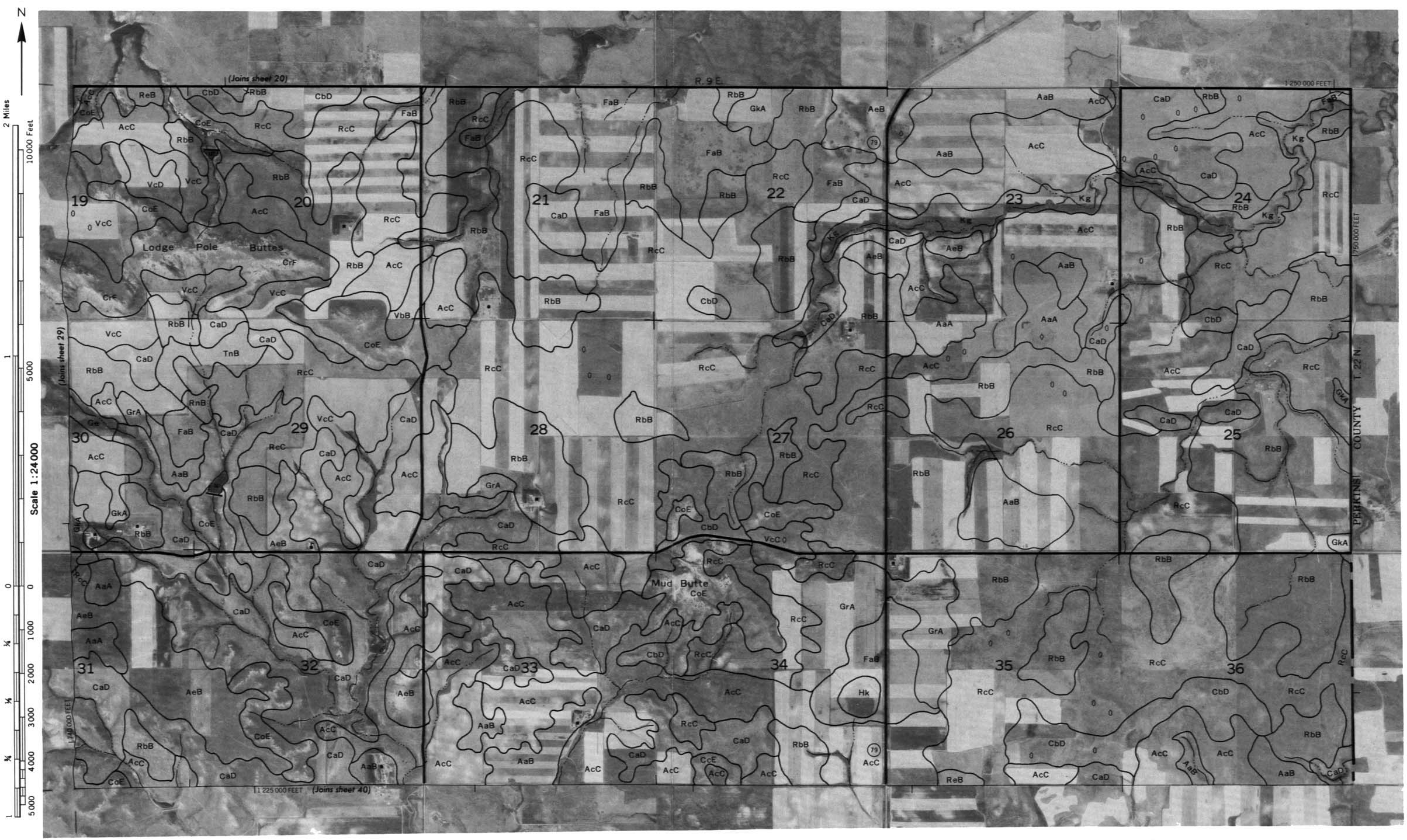


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 28

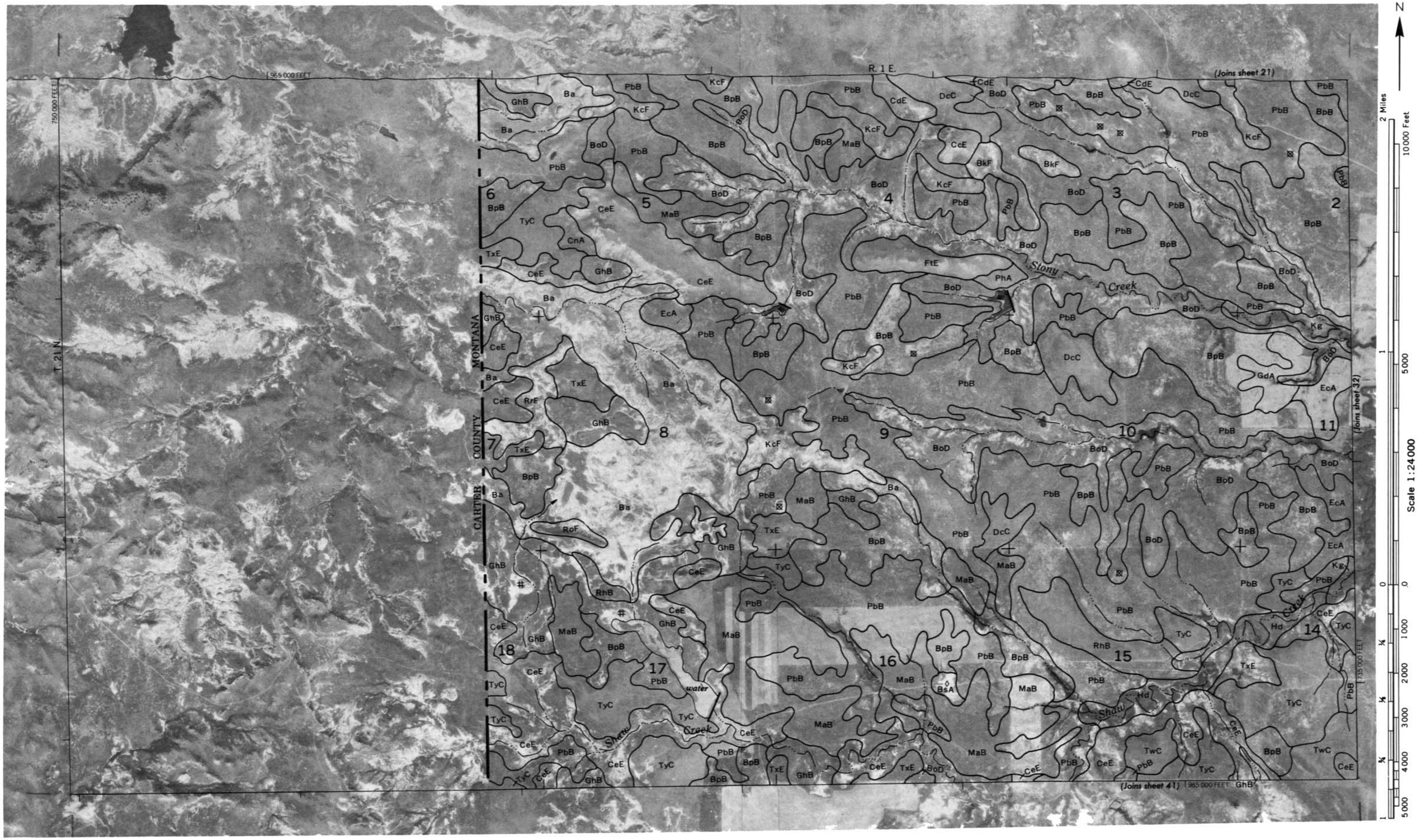
HARDING COUNTY, SOUTH DAKOTA NO. 29

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

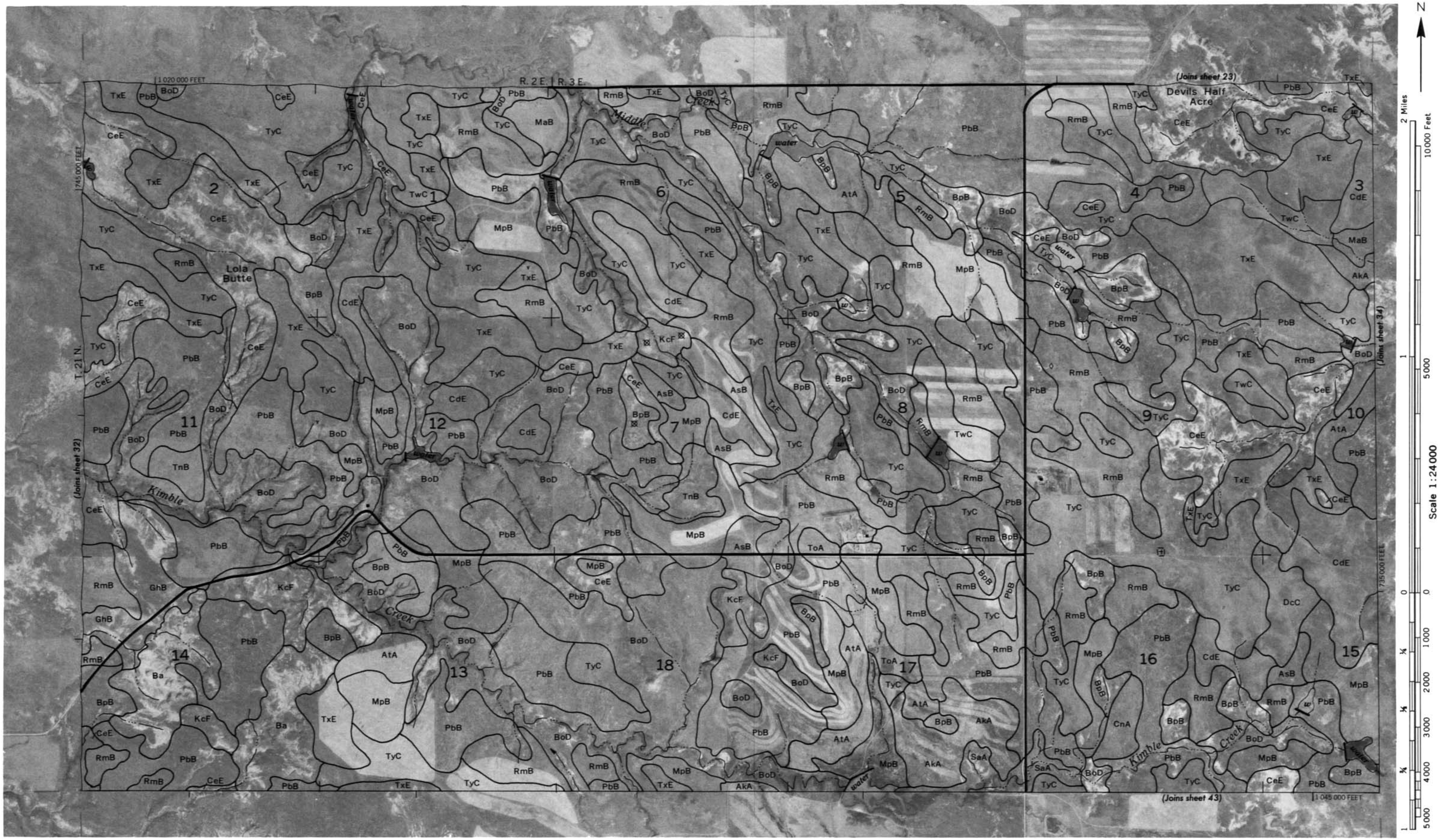
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

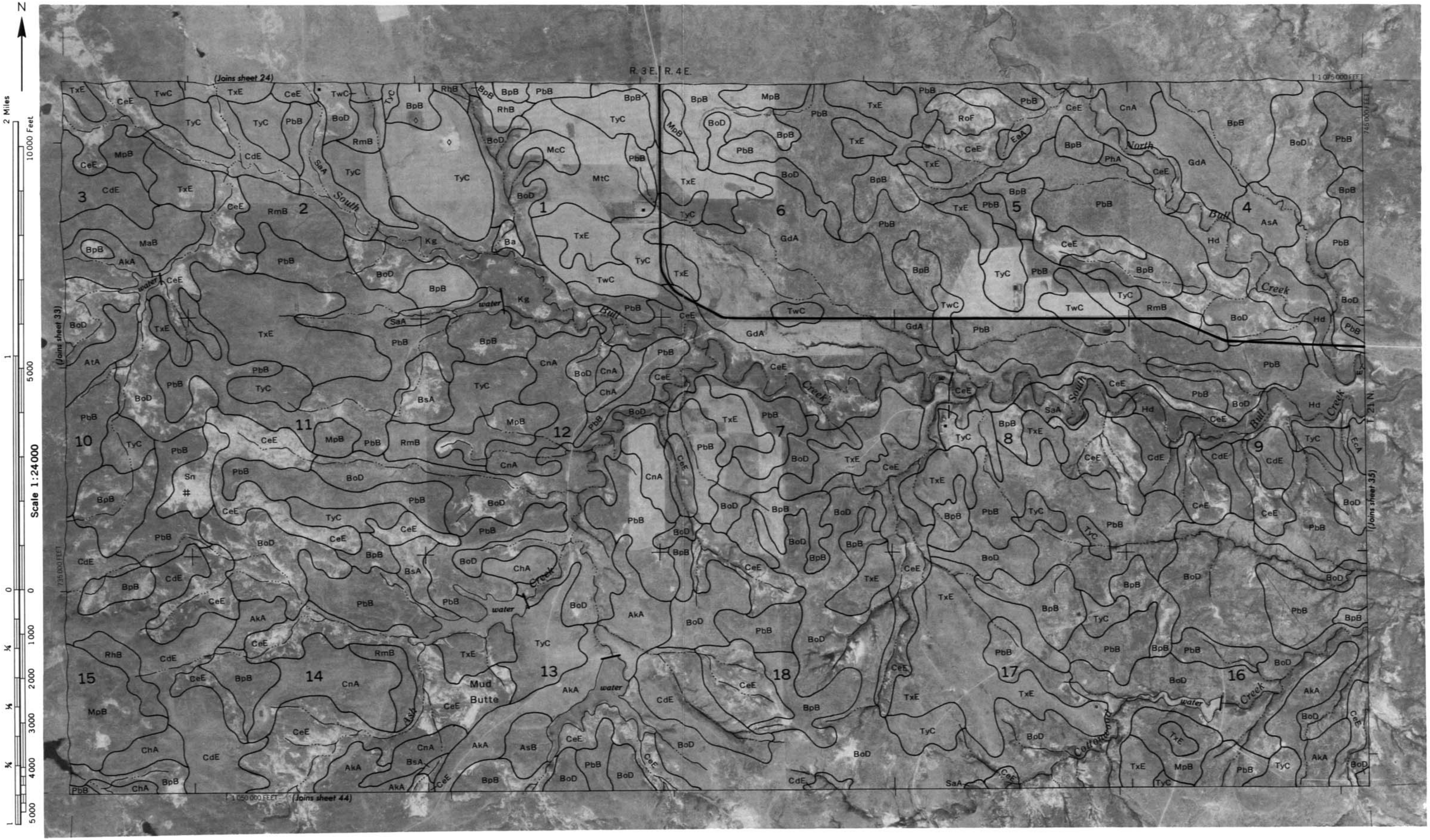


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

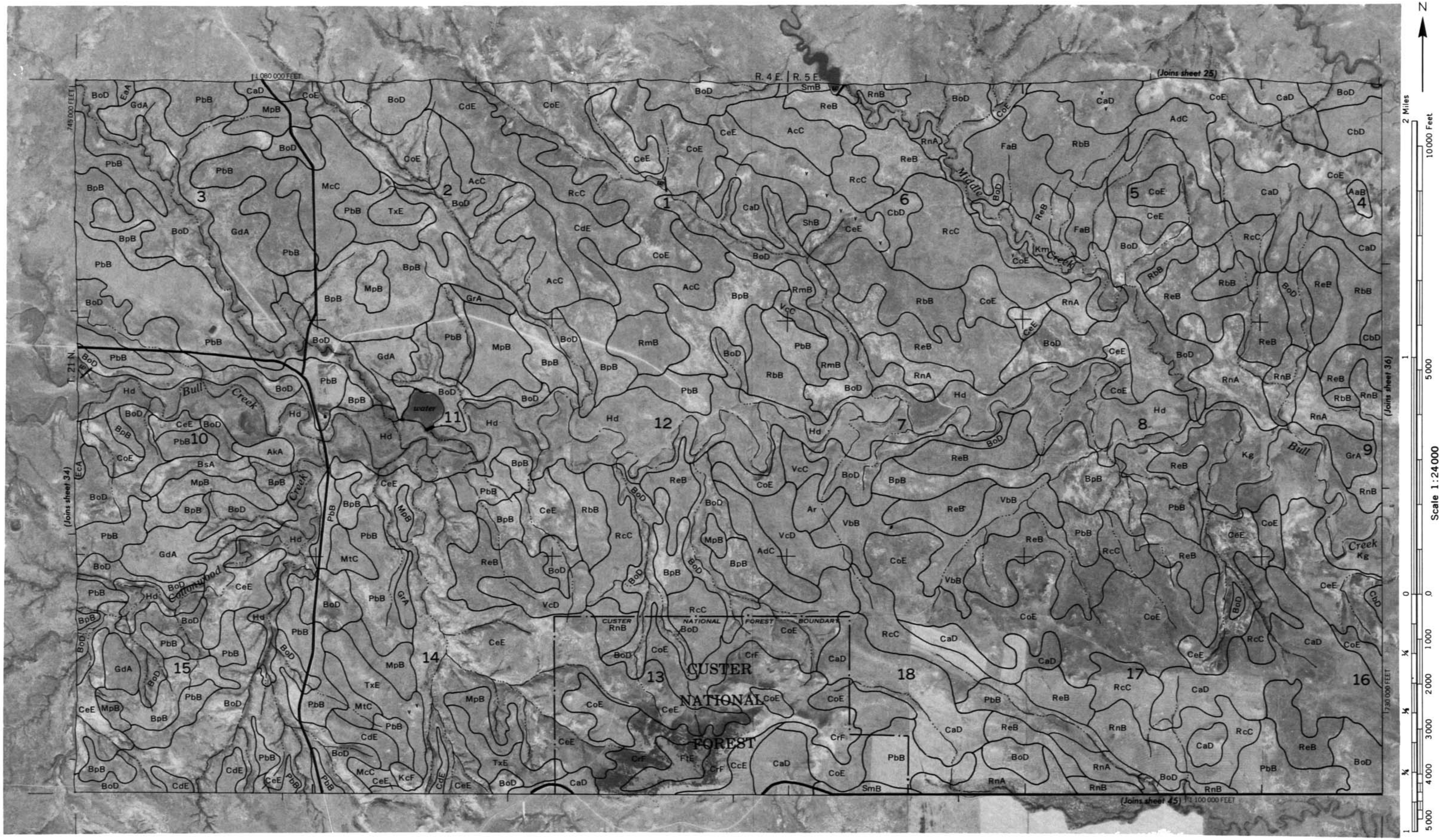
HARDING COUNTY, SOUTH DAKOTA NO. 33

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



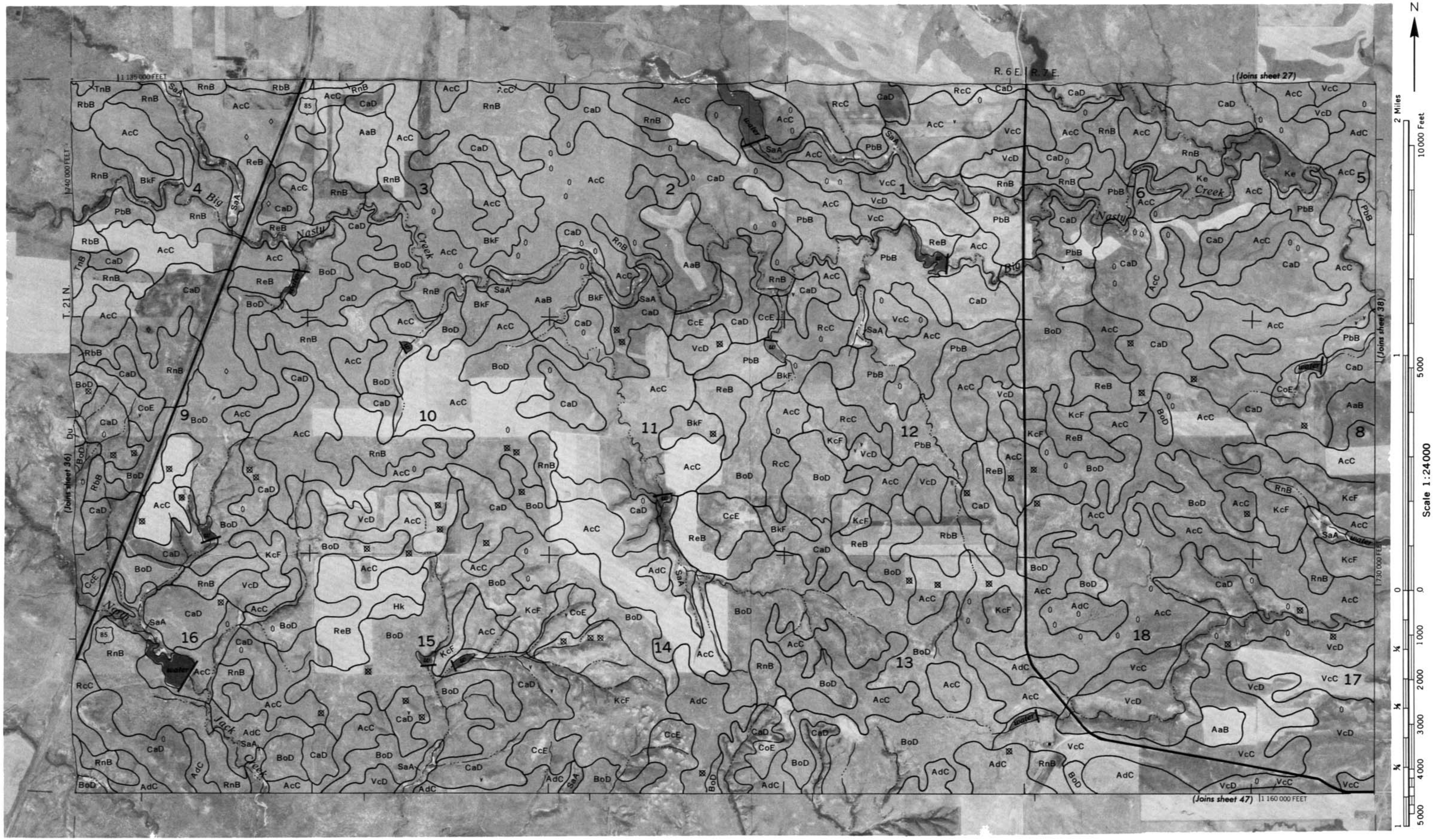


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

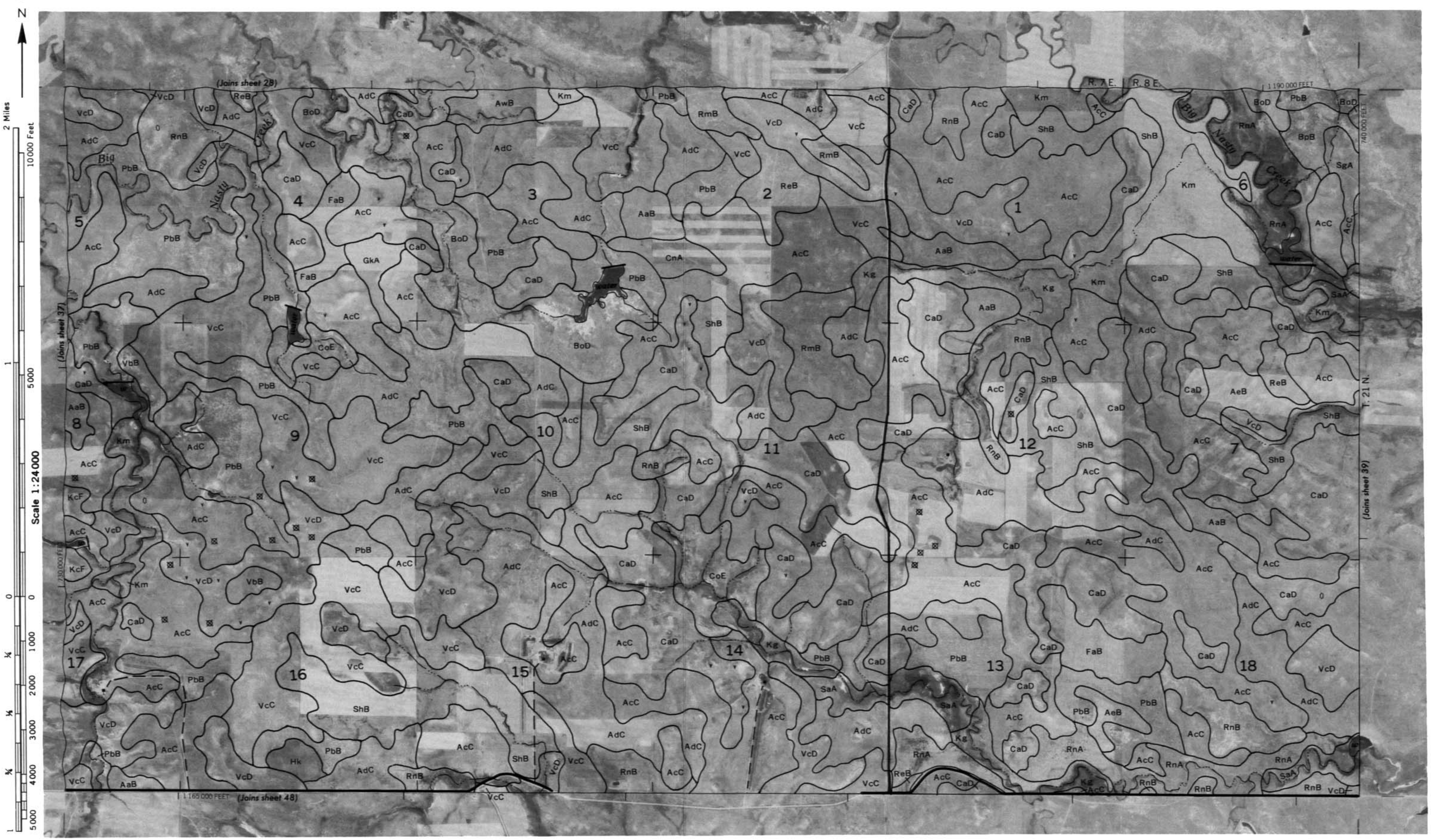
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



HARDING COUNTY, SOUTH DAKOTA NO. 37

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(38)



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 38

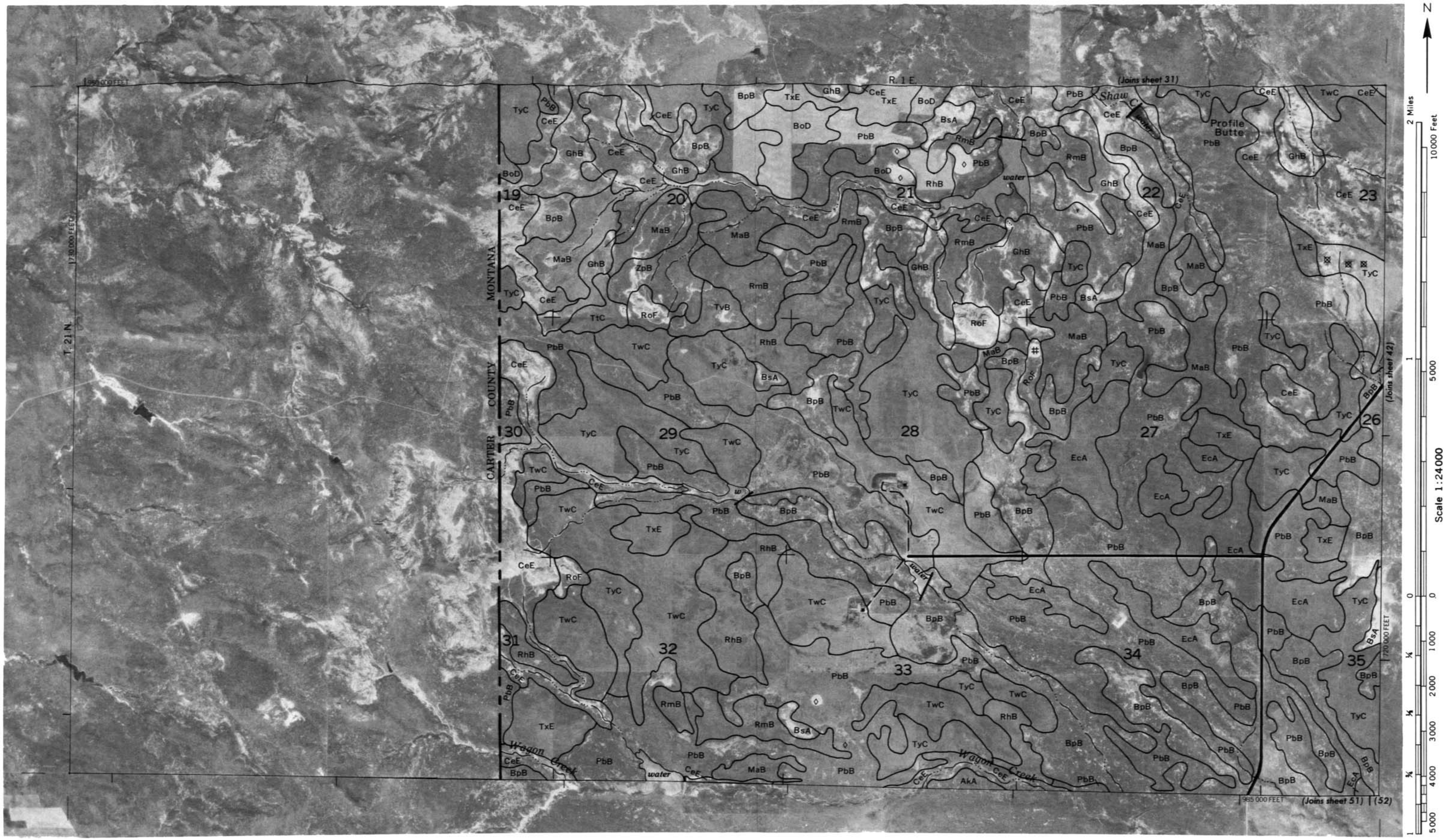
HARDING COUNTY, SOUTH DAKOTA NO. 39

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 40

41

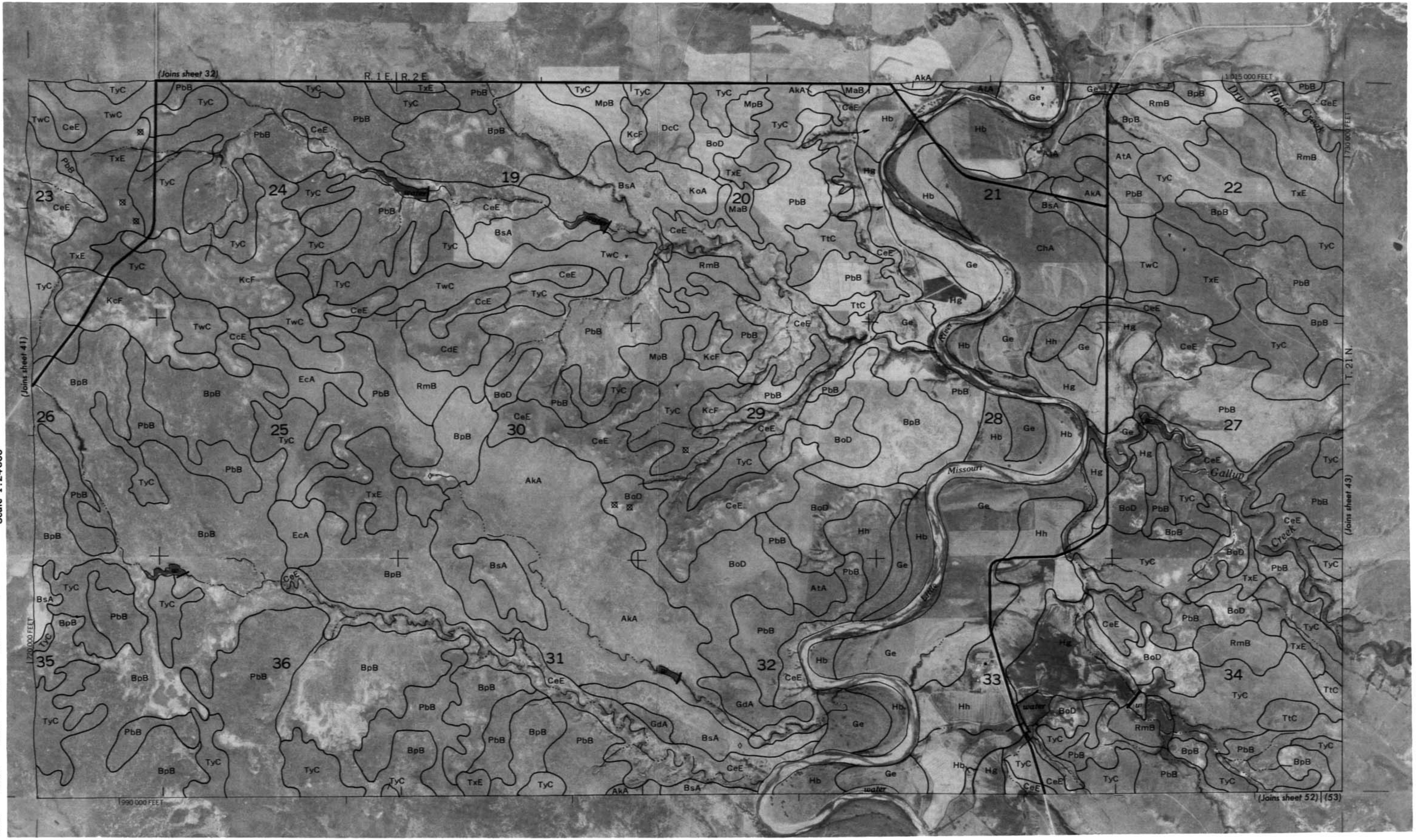


HARDING COUNTY, SOUTH DAKOTA NO. 41

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

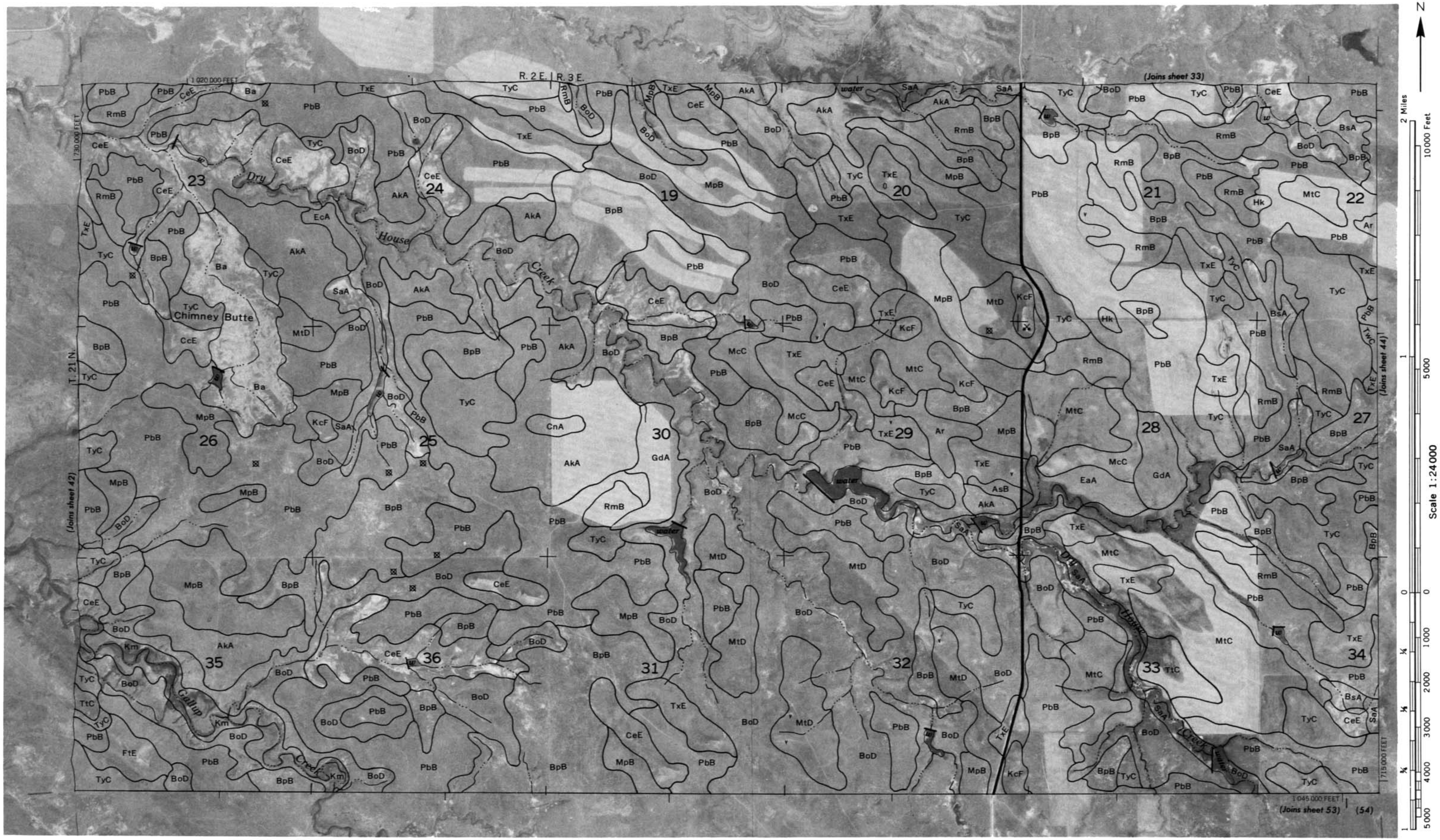
N

2 Miles
10 000 Feet
1
5000
Scale 1:24000
0
0
1000
2000
3000
4000
5000
1



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 42



HARDING COUNTY, SOUTH DAKOTA NO. 43

This map is compiled on 1976 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

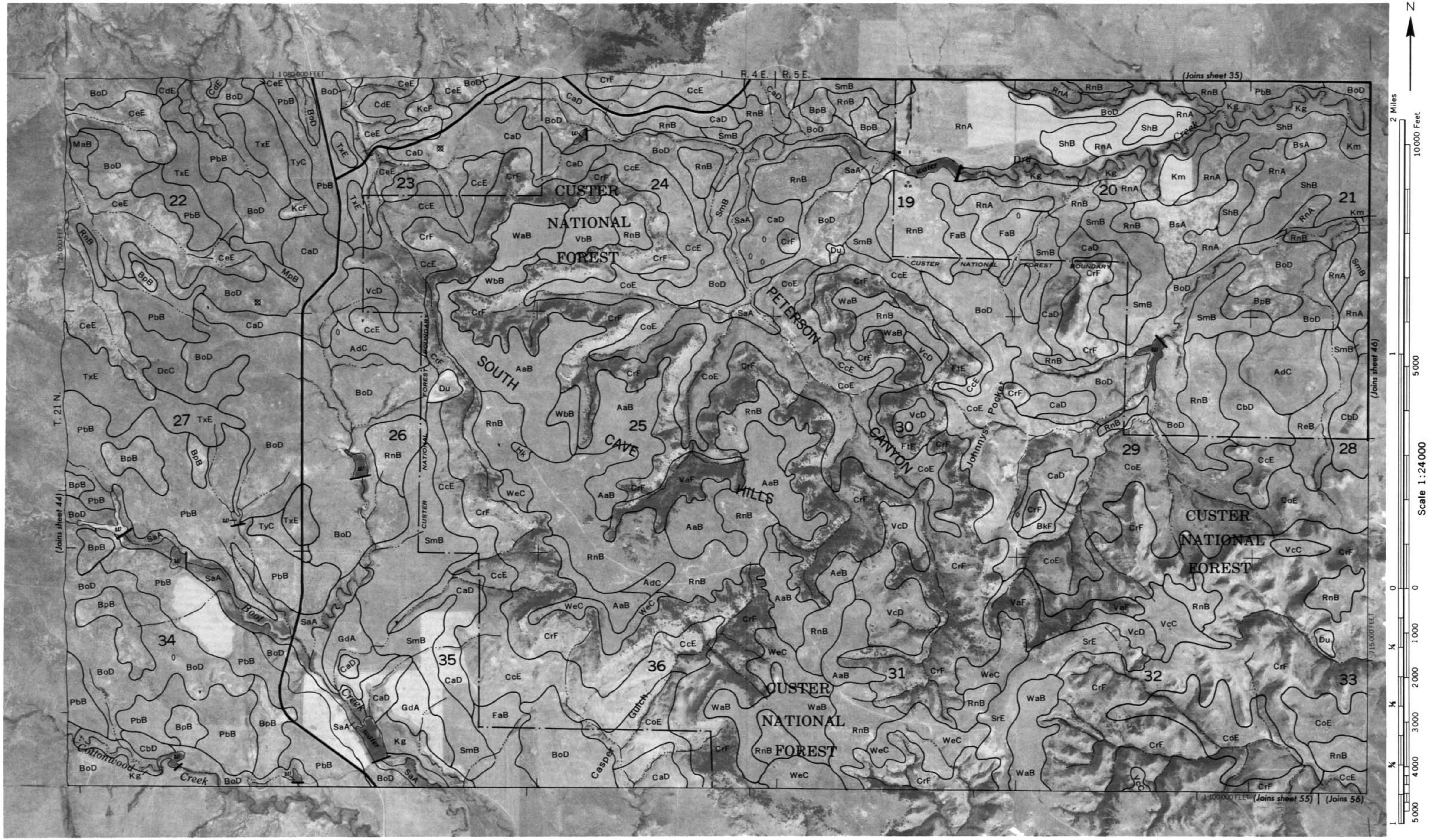
44

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 44

HARDING COUNTY, SOUTH DAKOTA NO. 45

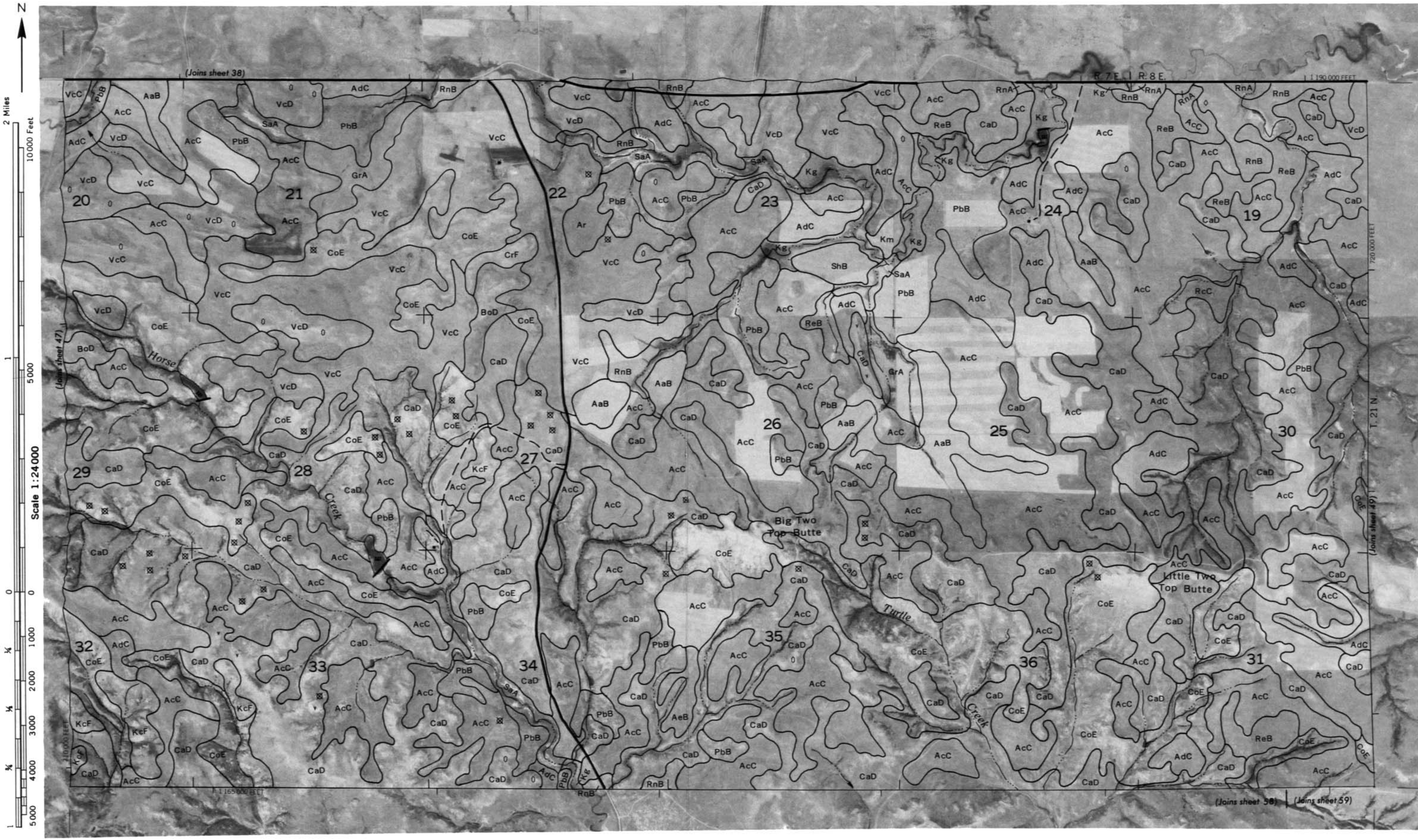
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



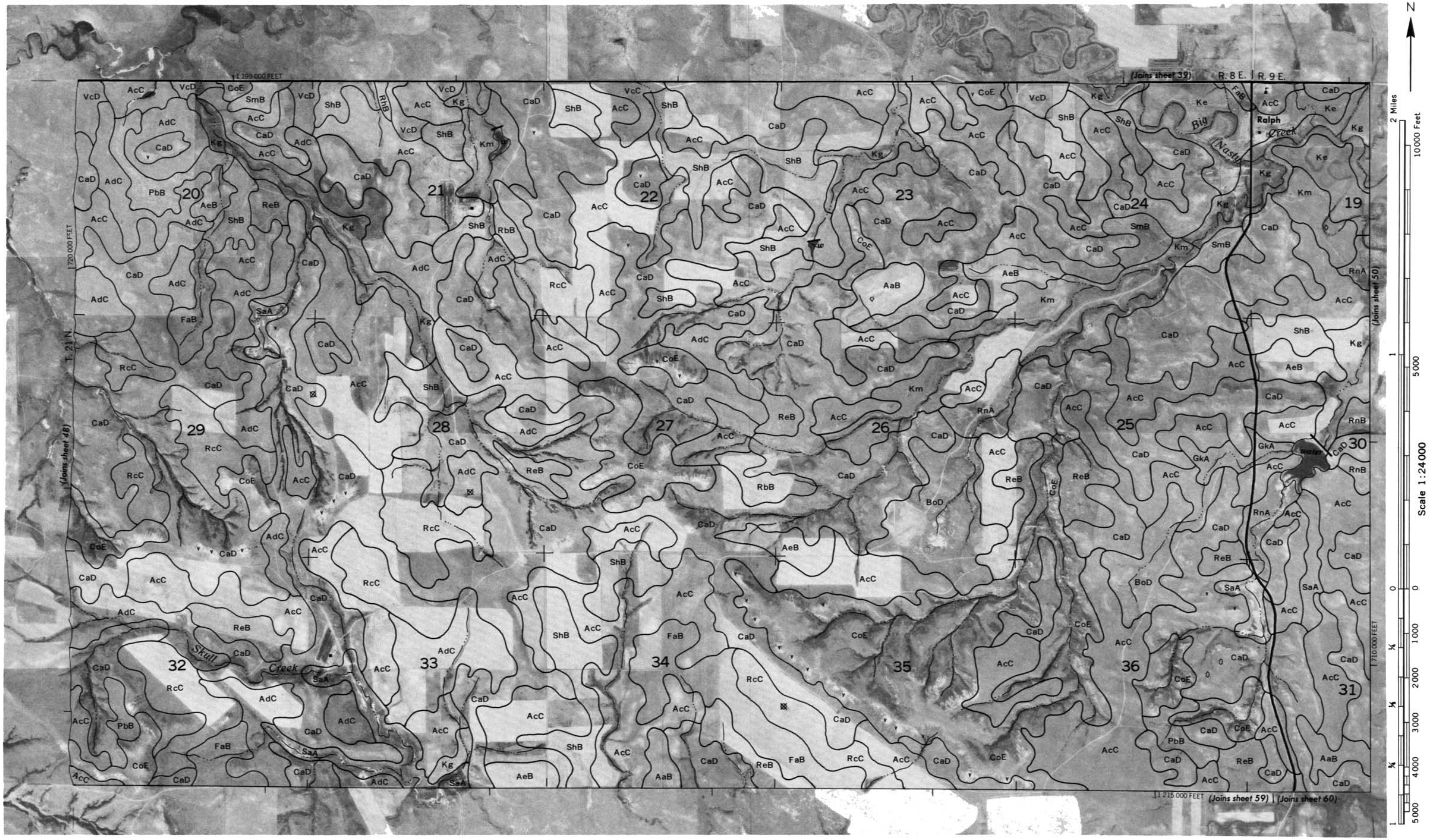
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 47

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

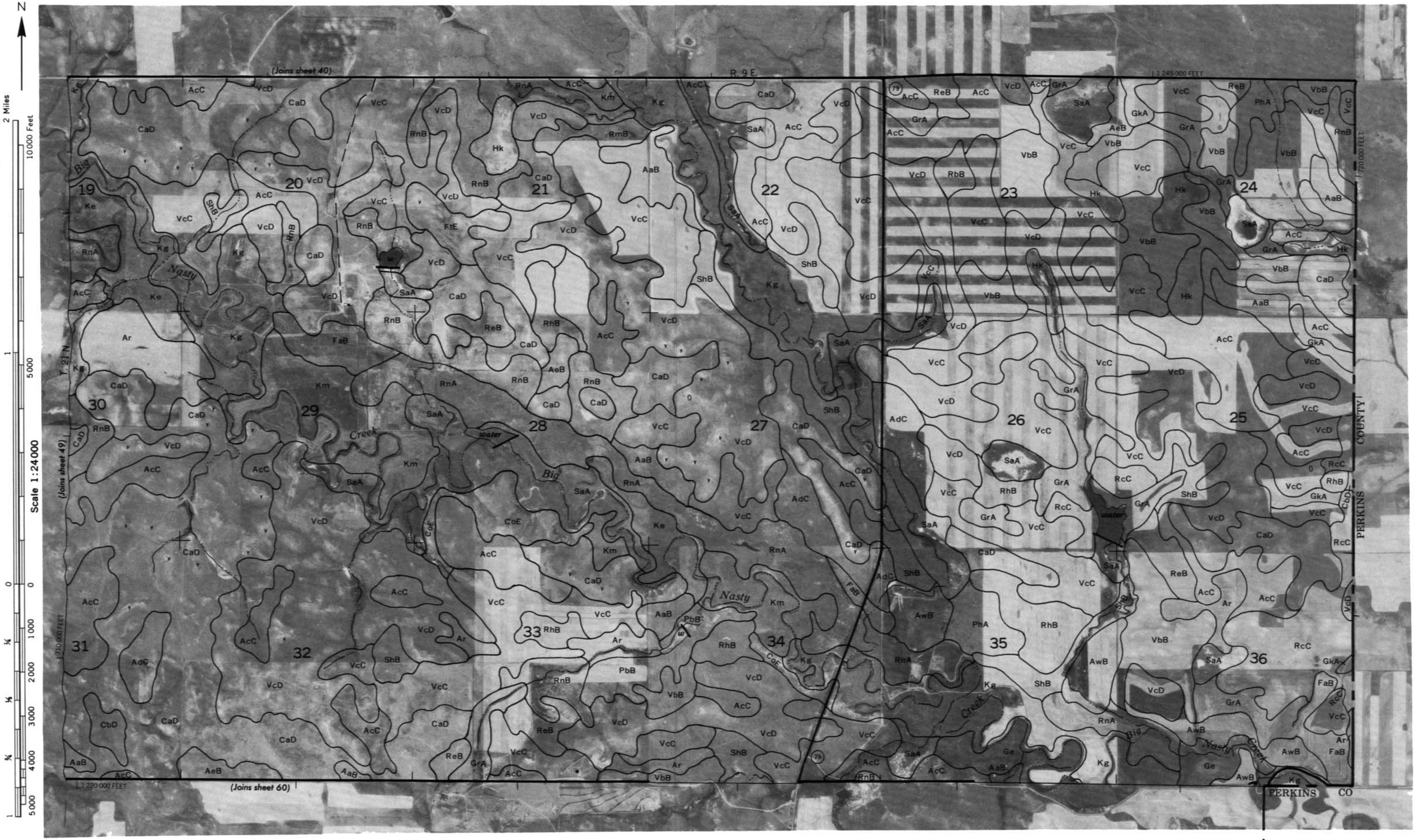


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



HARDING COUNTY, SOUTH DAKOTA NO. 49

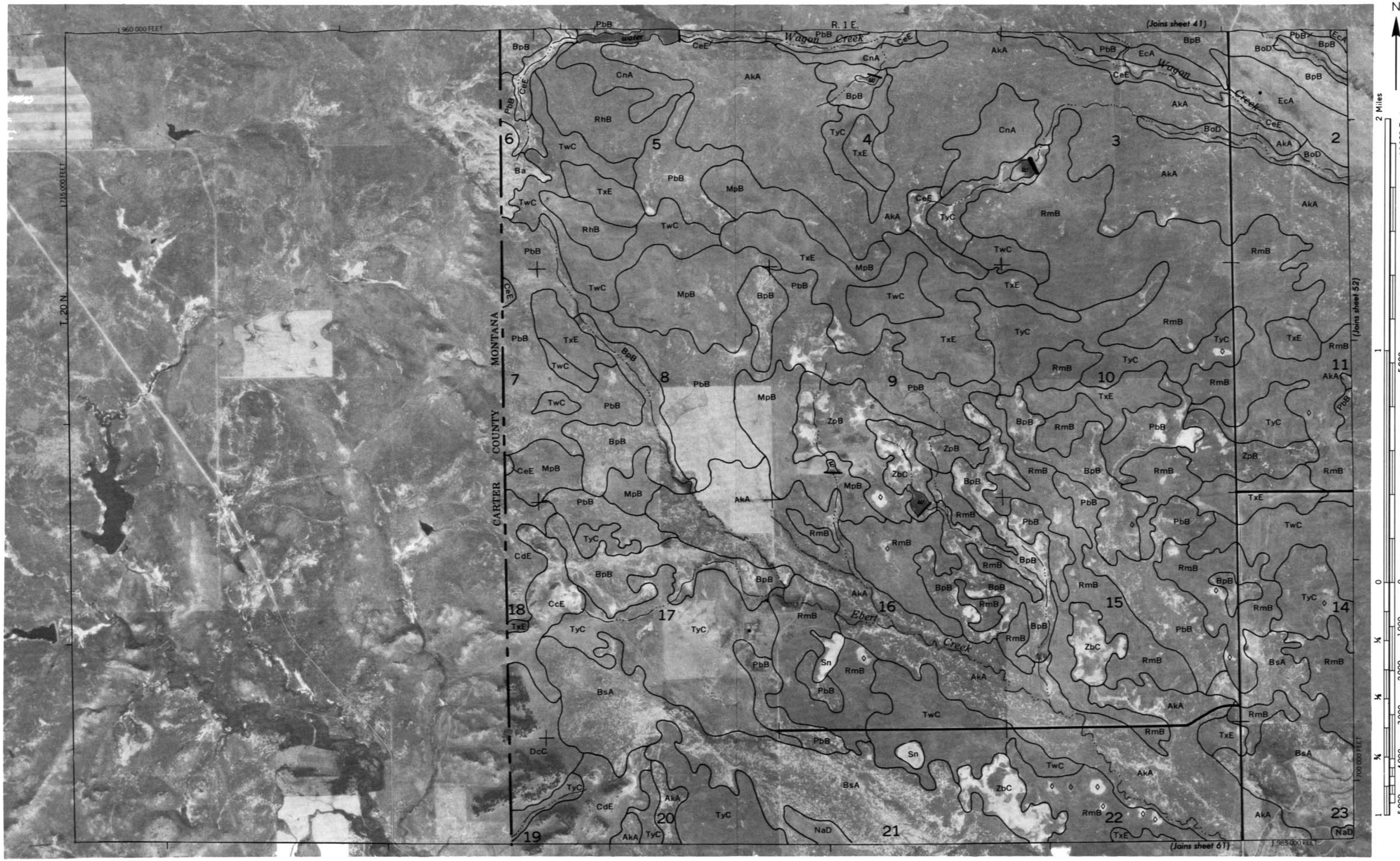
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



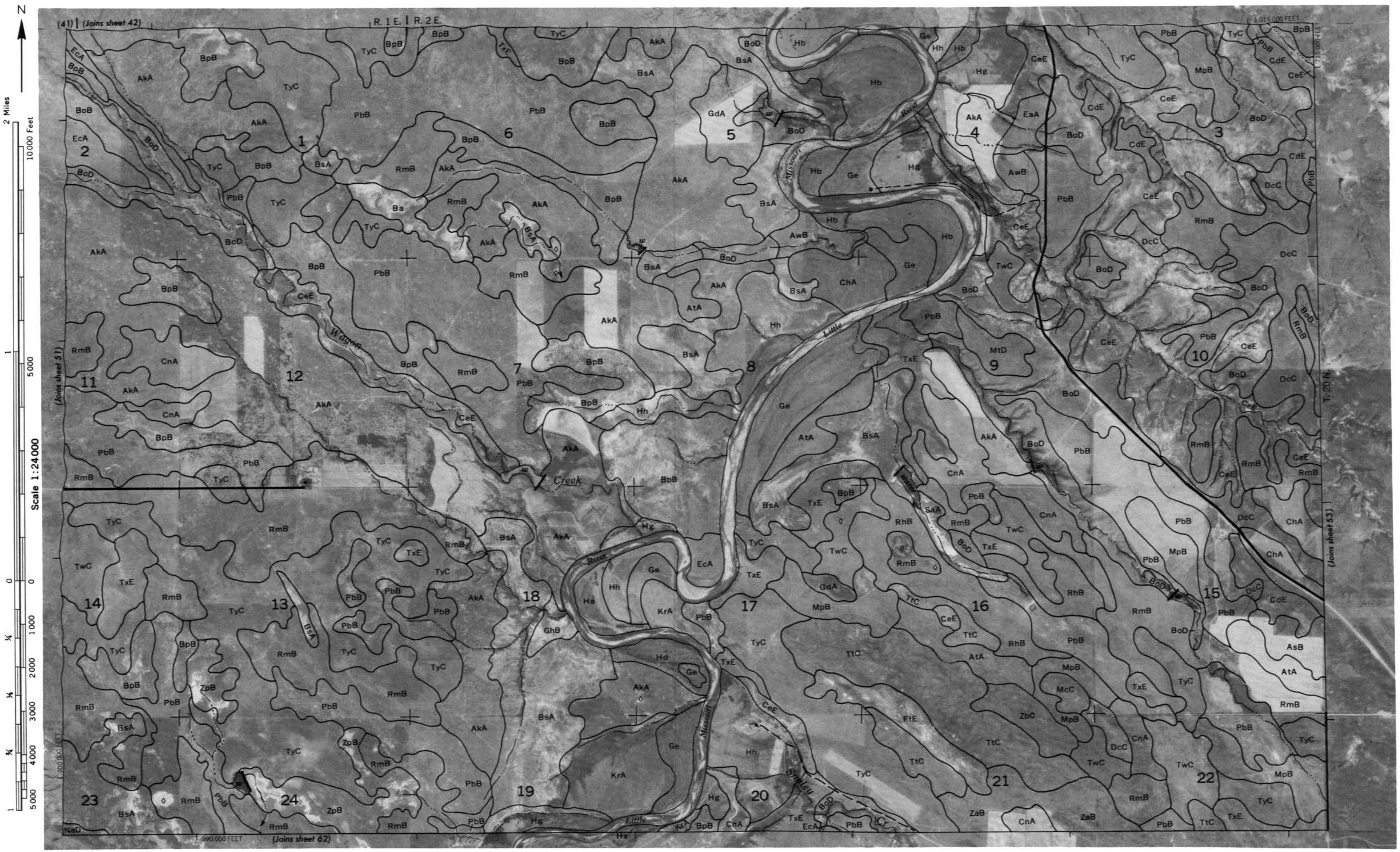
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 51

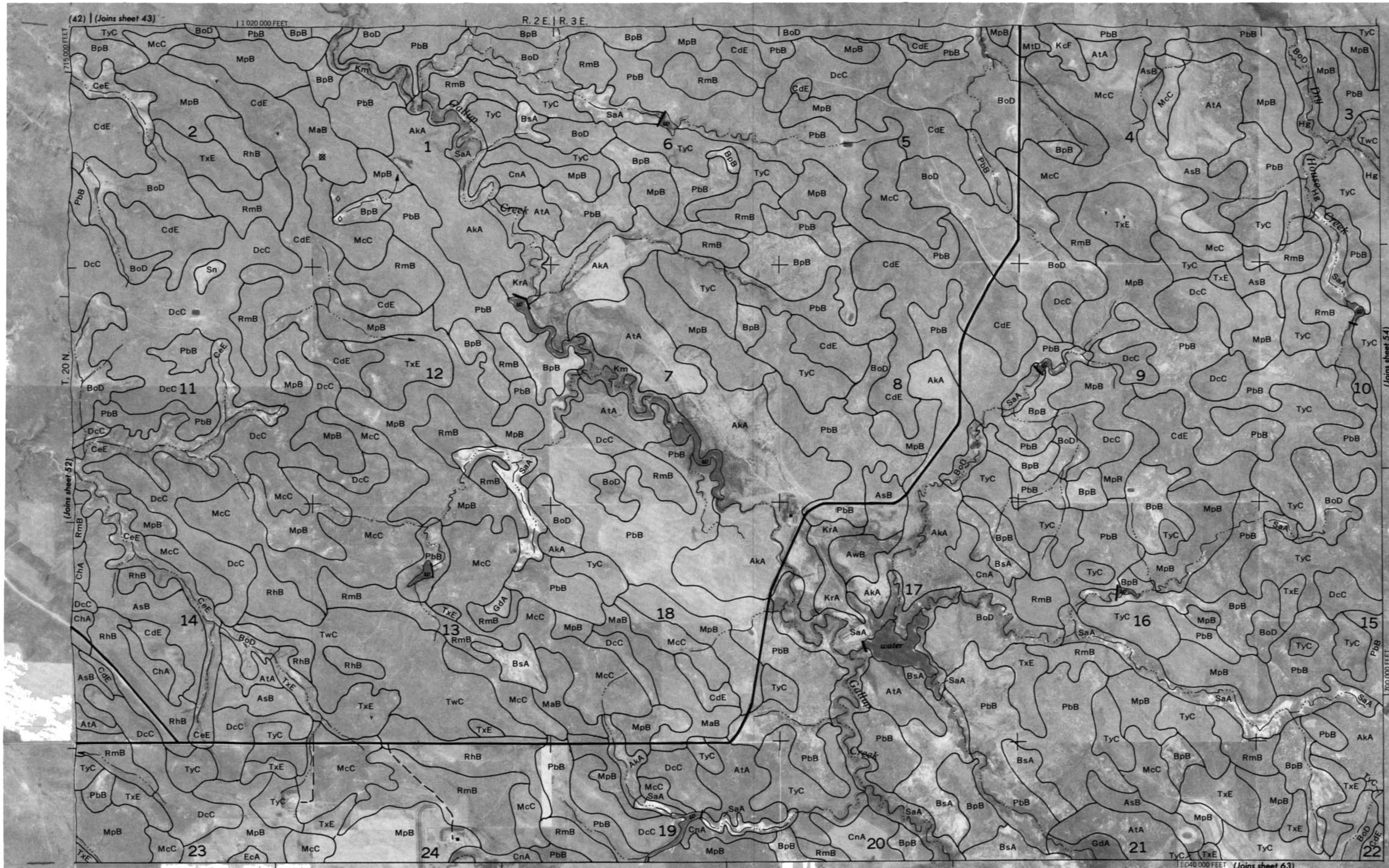
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



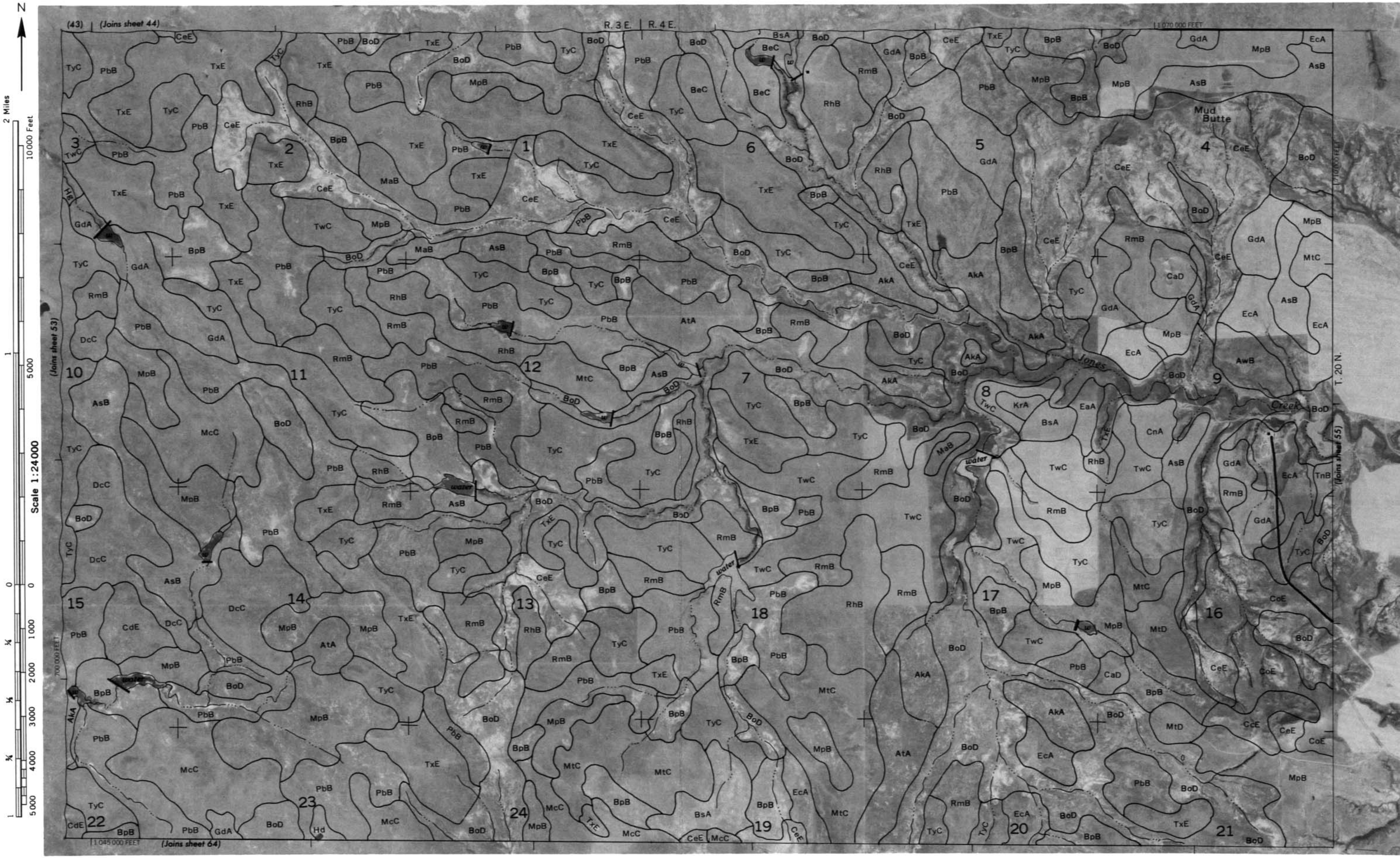
HARDING COUNTY, SOUTH DAKOTA — SHEET NUMBER 52



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



HARDING COUNTY, SOUTH DAKOTA NO. 53
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

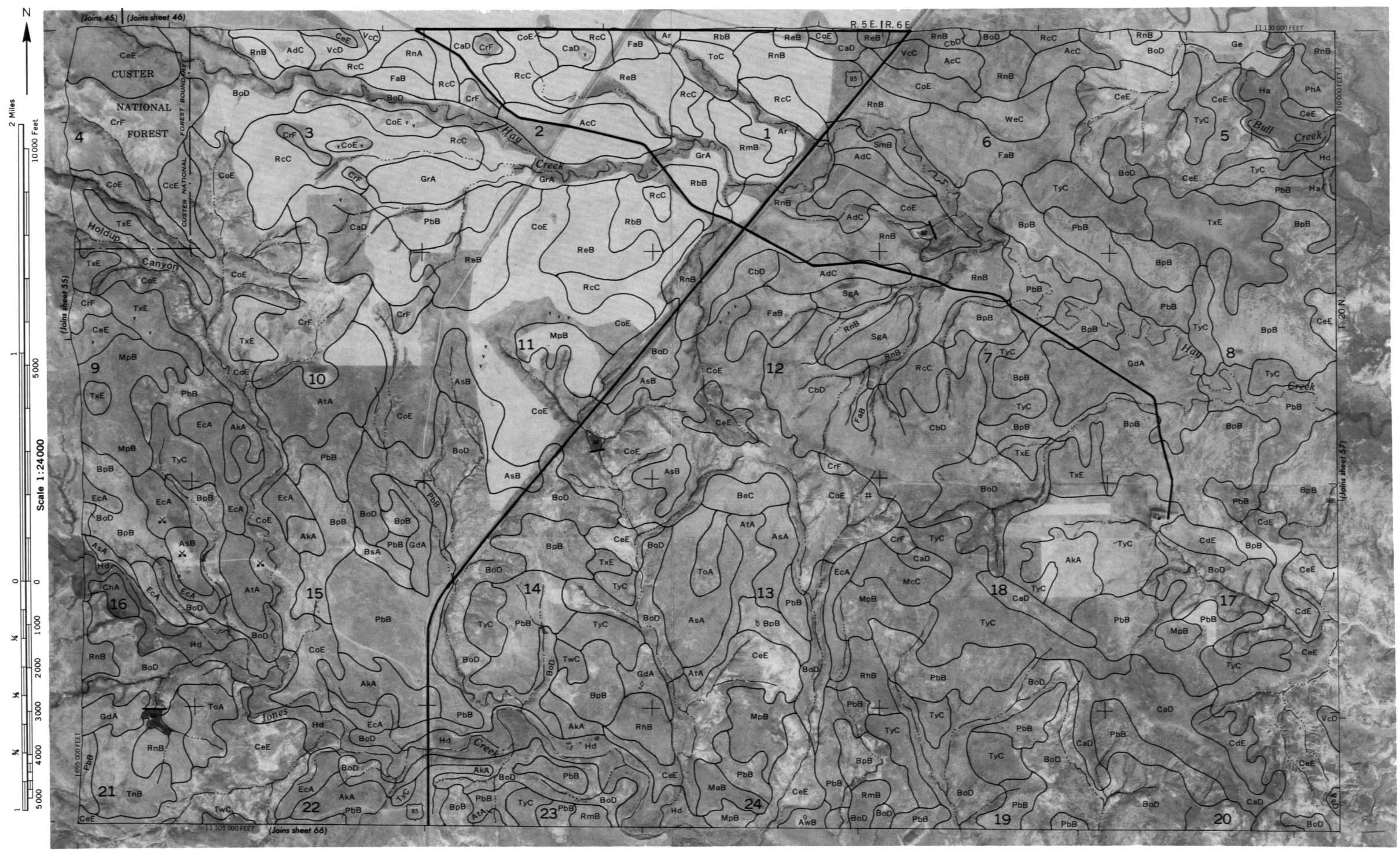


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

55

HARDING COUNTY, SOUTH DAKOTA NO. 55

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

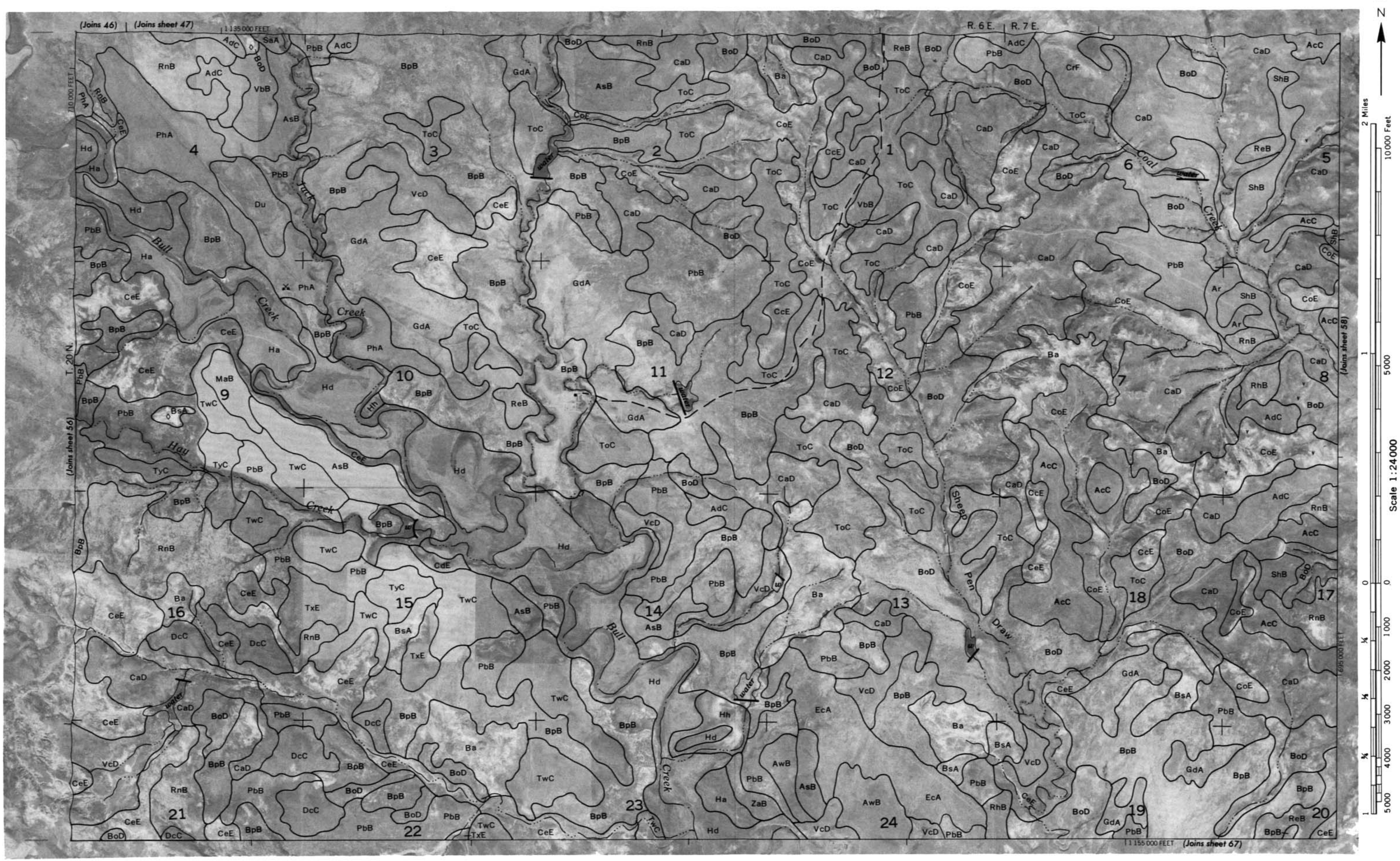


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

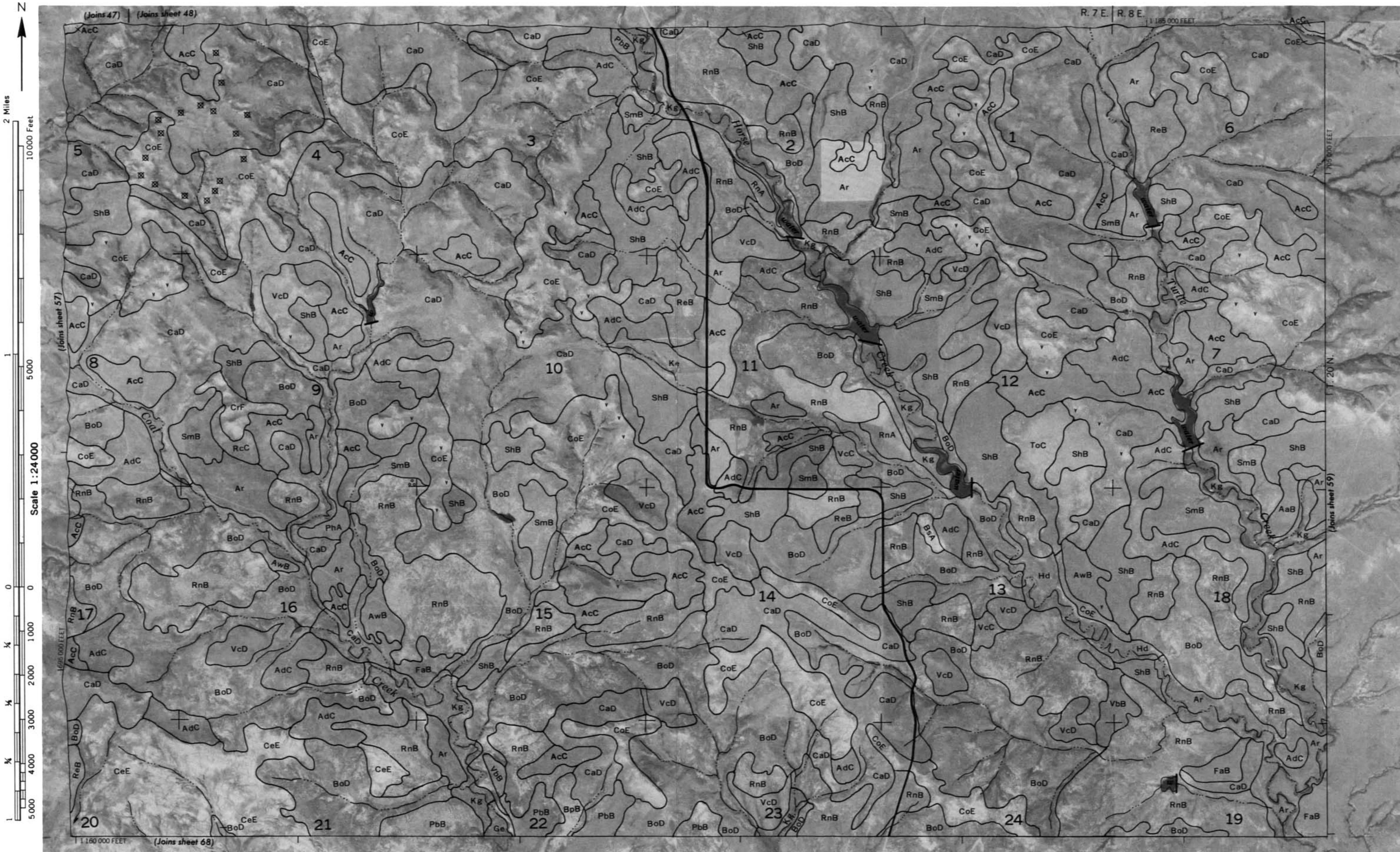
HARDING COUNTY, SOUTH DAKOTA NO. 56

HARDING COUNTY, SOUTH DAKOTA NO. 57

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

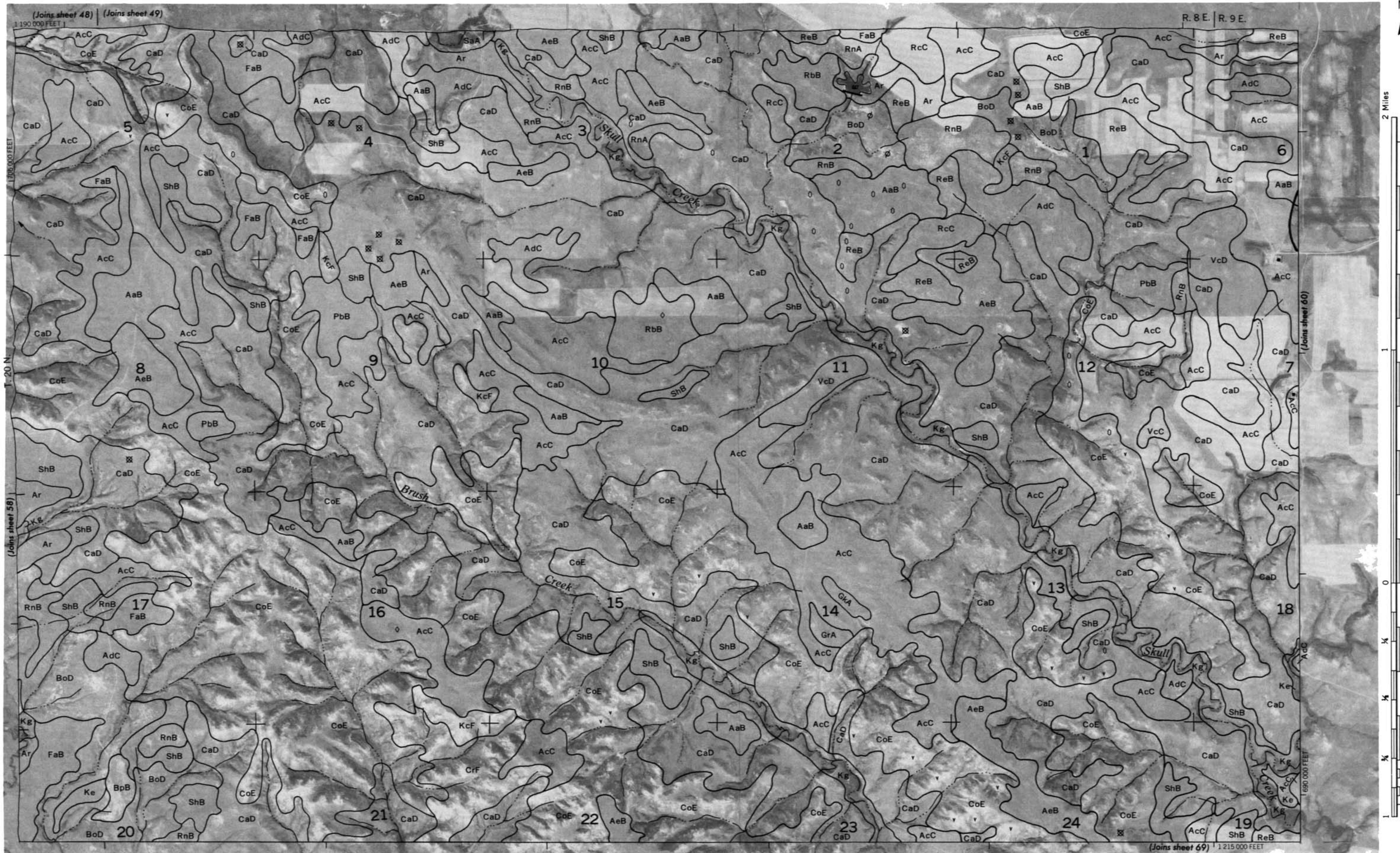


HARDING COUNTY, SOUTH DAKOTA — SHEET NUMBER 58



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

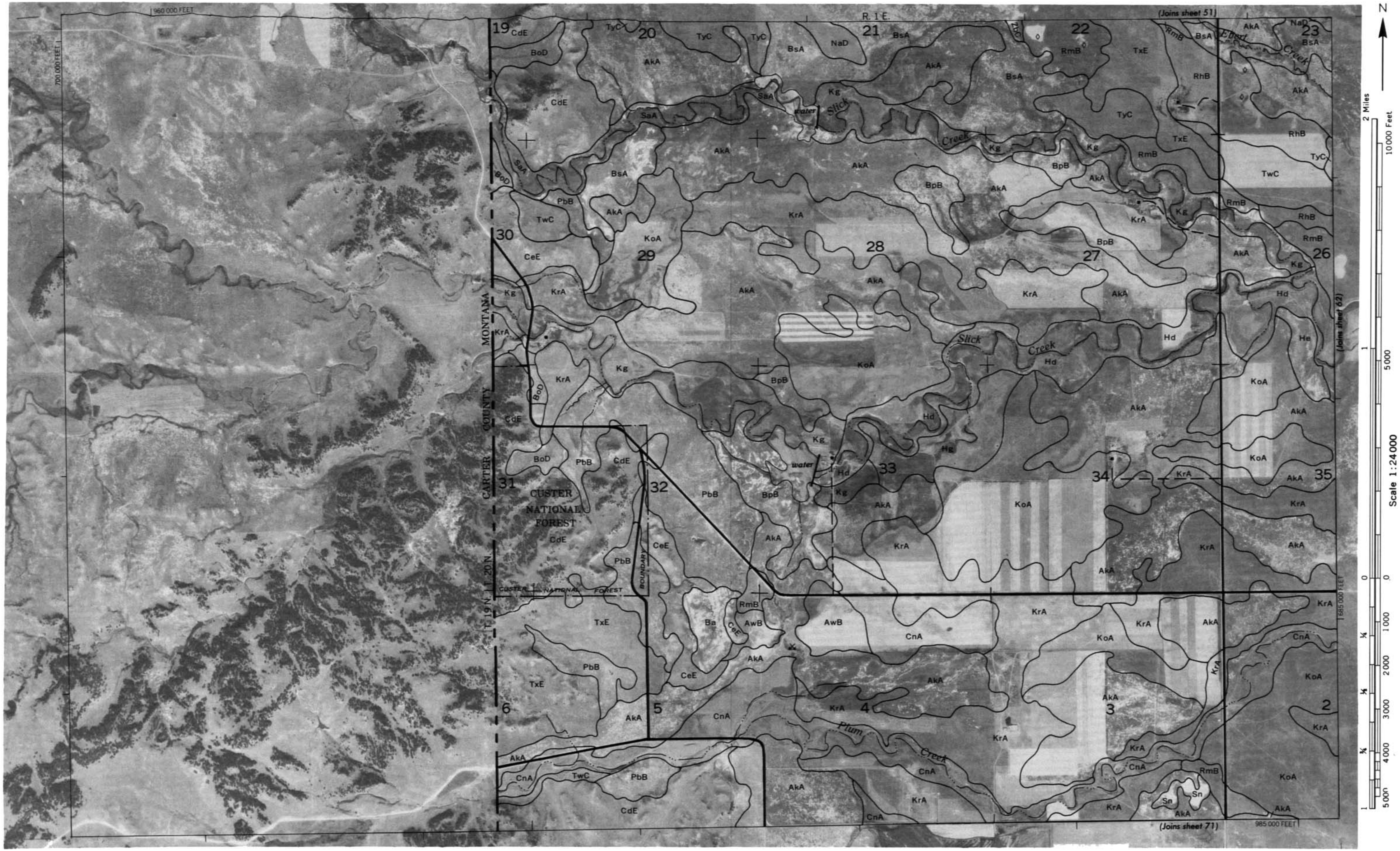
HARDING COUNTY, SOUTH DAKOTA NO. 58



HARDING COUNTY, SOUTH DAKOTA NO. 59

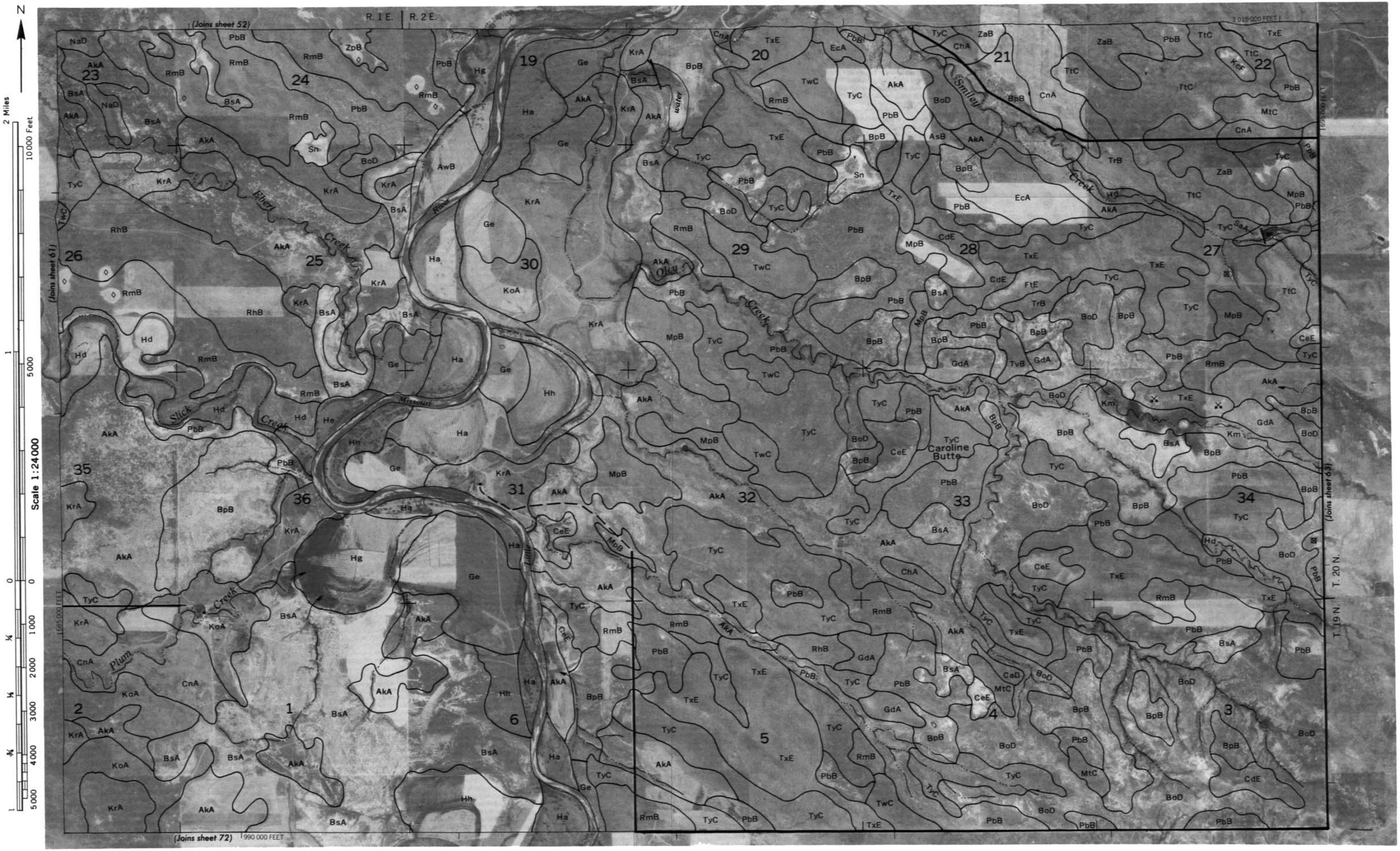
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



HARDING COUNTY, SOUTH DAKOTA NO. 61

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

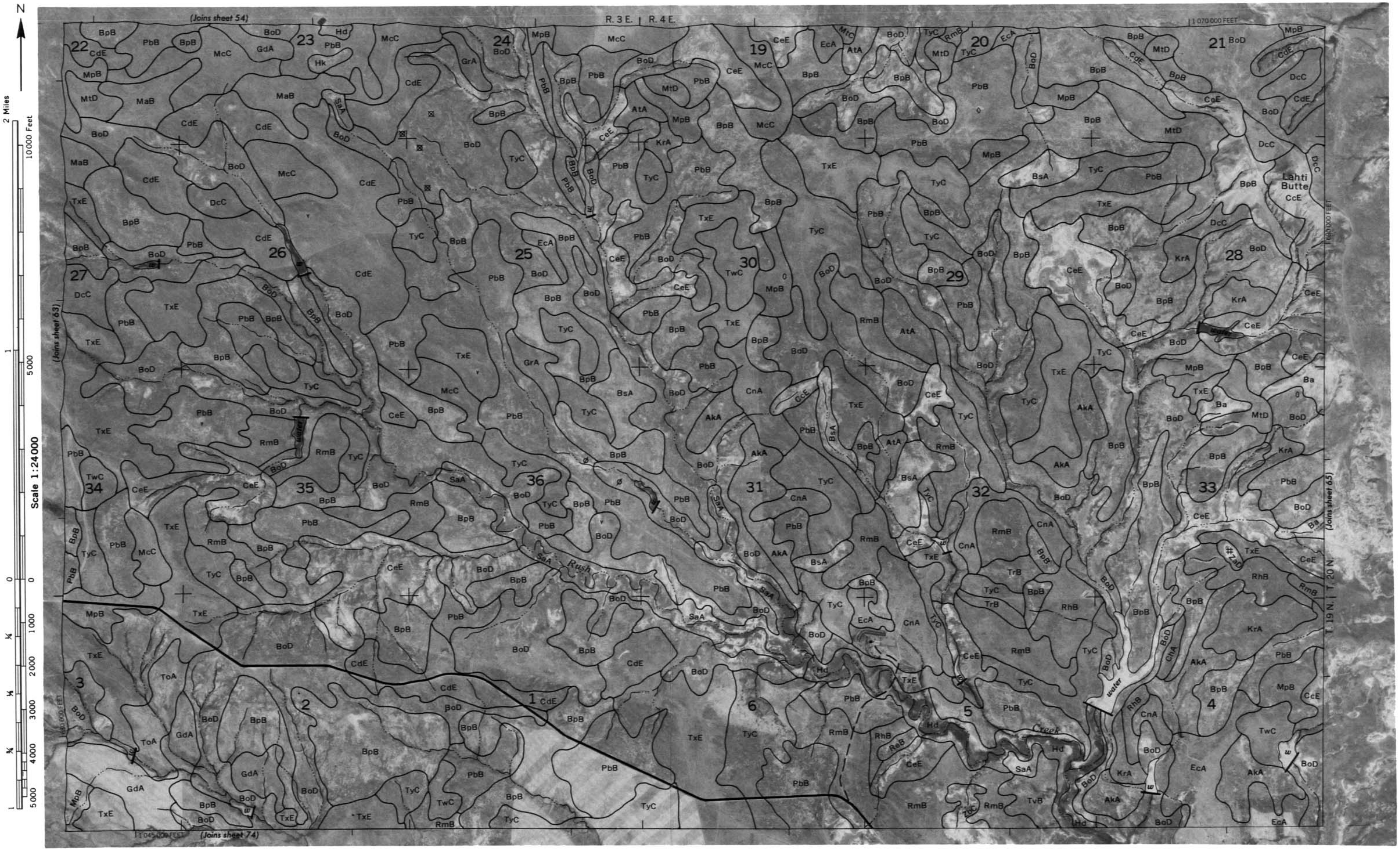


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 63

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA — SHEET NUMBER 64

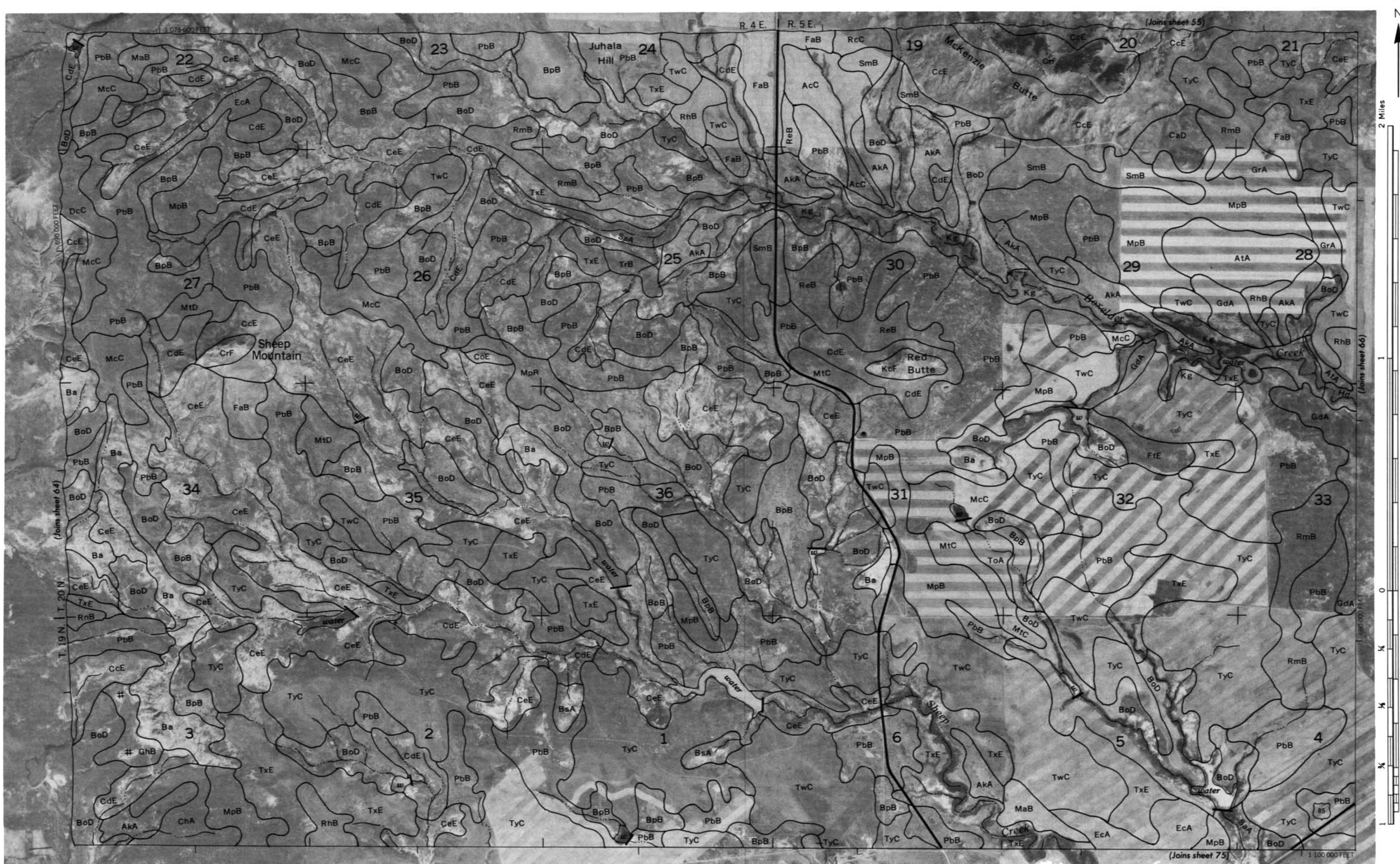


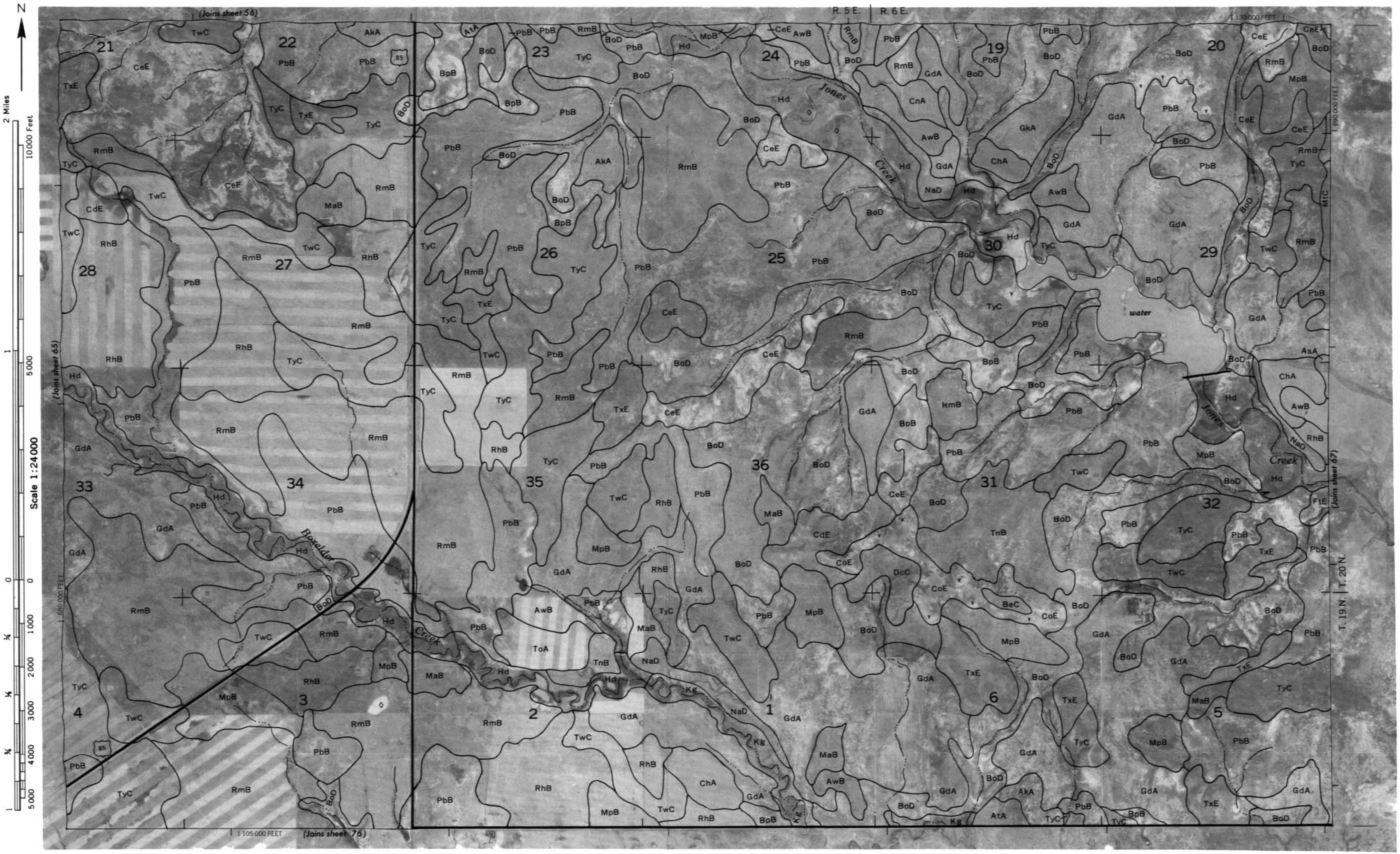
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 64

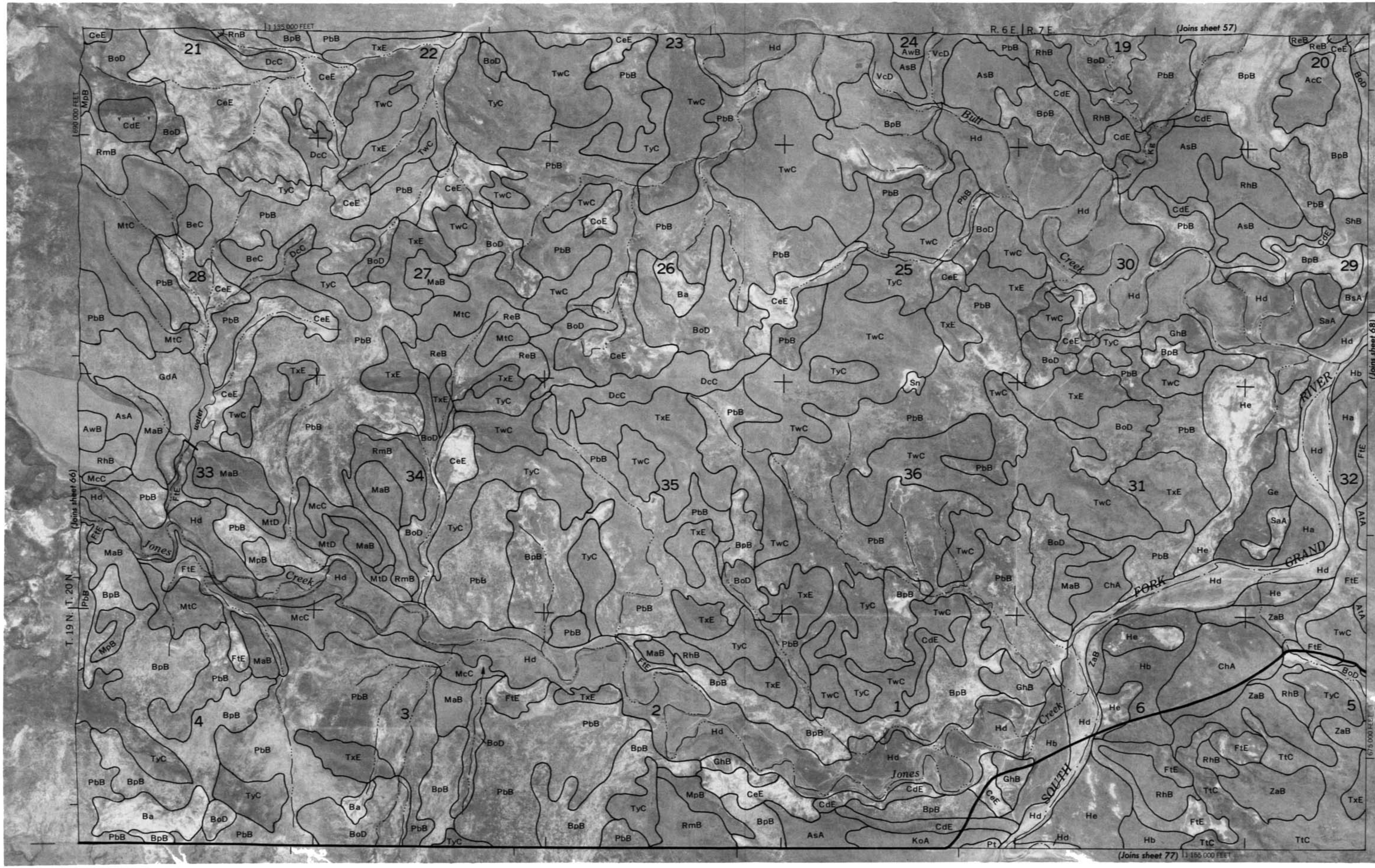
HARDING COUNTY, SOUTH DAKOTA NO. 65

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



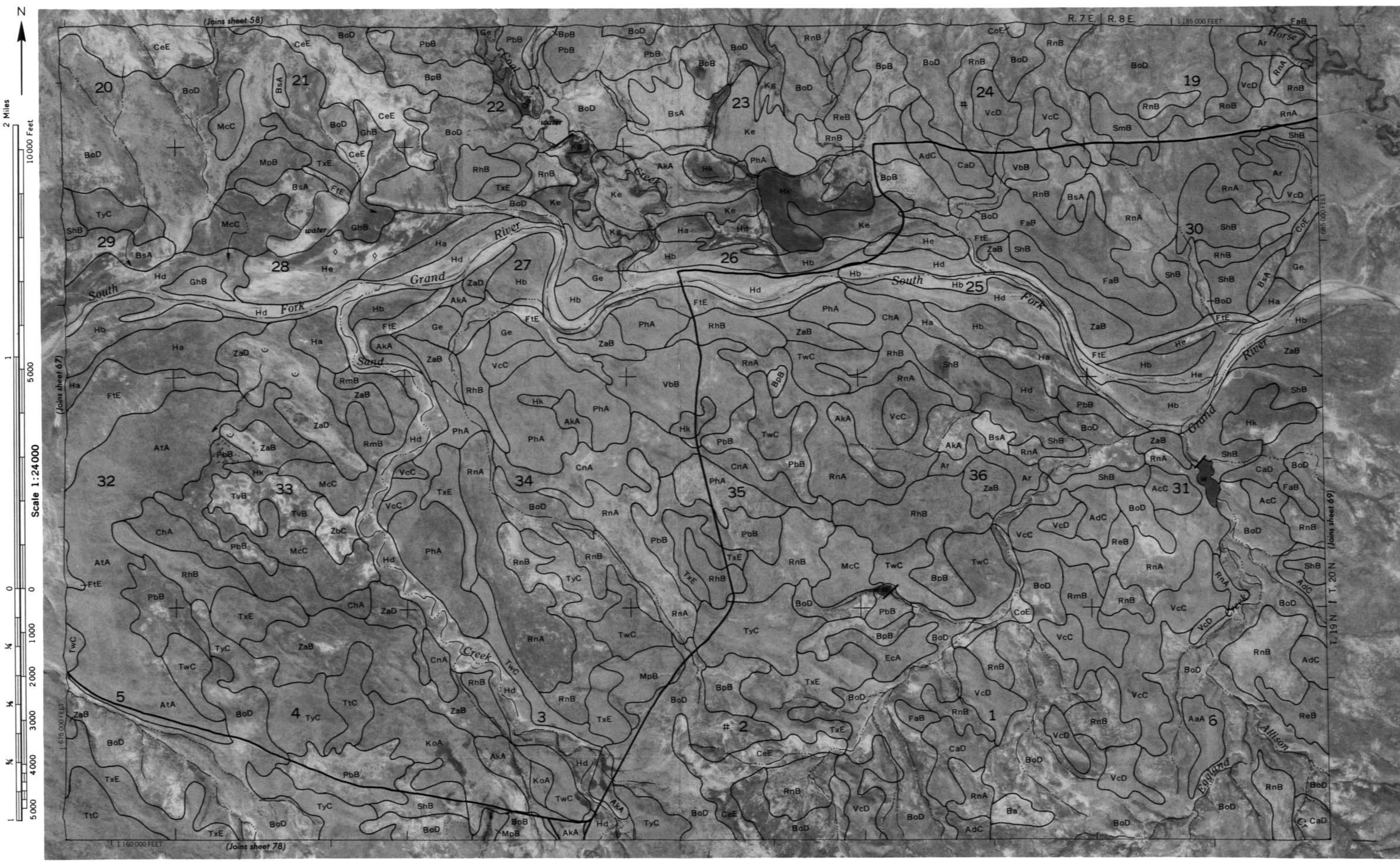
N

Scale 1:24 000

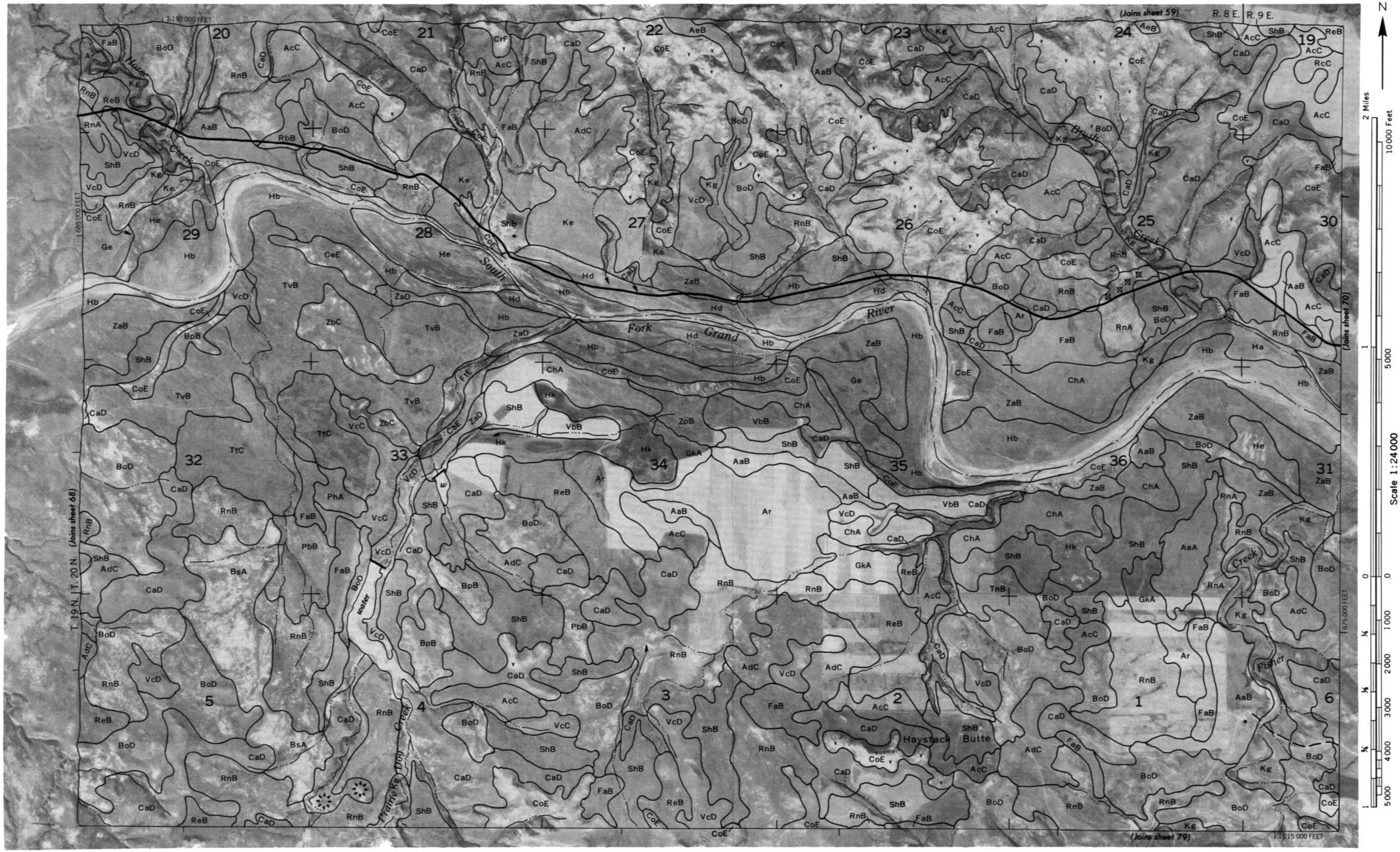
2 Miles
1
0
10000 Feet
5000
0

HARDING COUNTY, SOUTH DAKOTA NO. 67

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

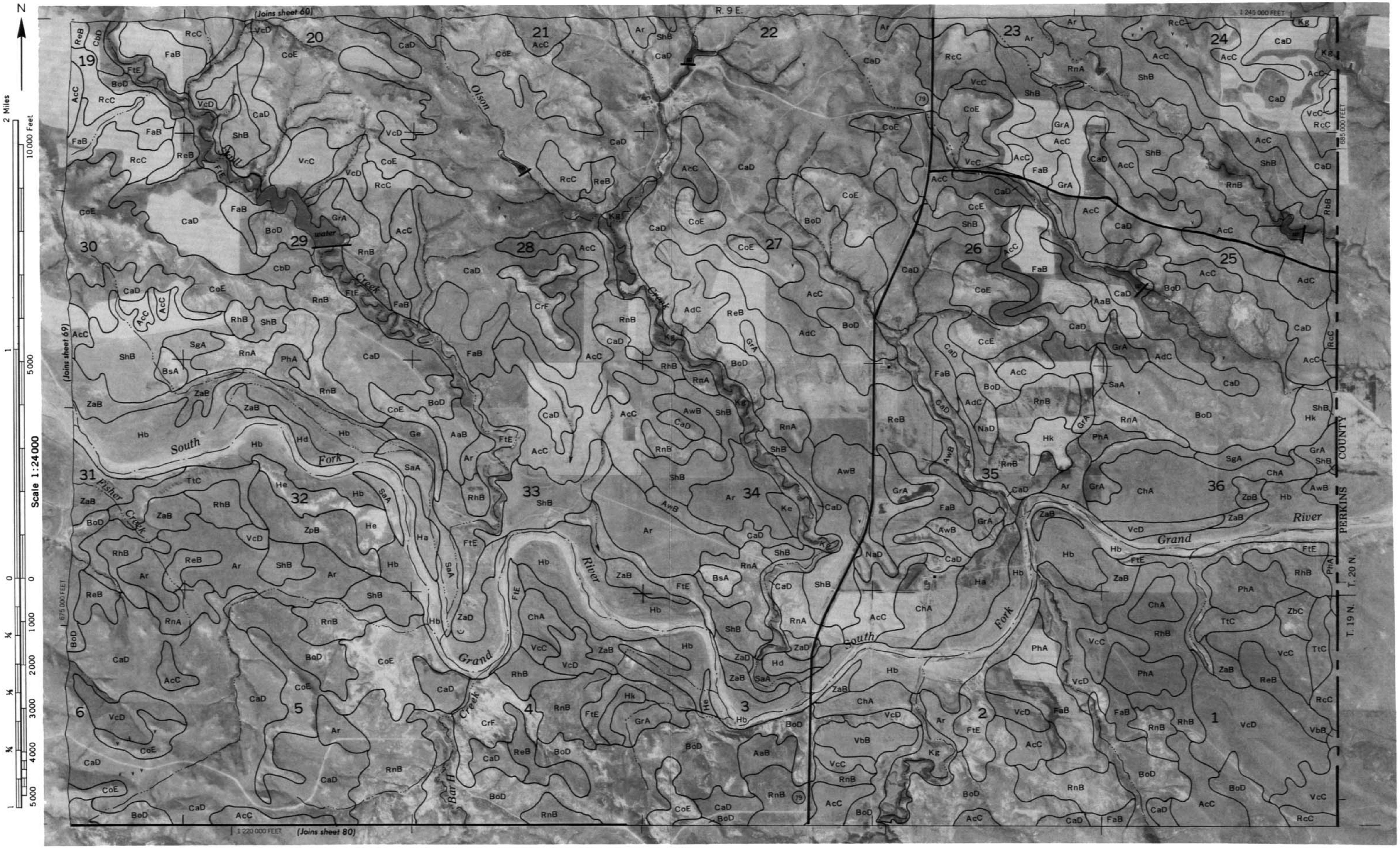


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



HARDING COUNTY, SOUTH DAKOTA NO. 69

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

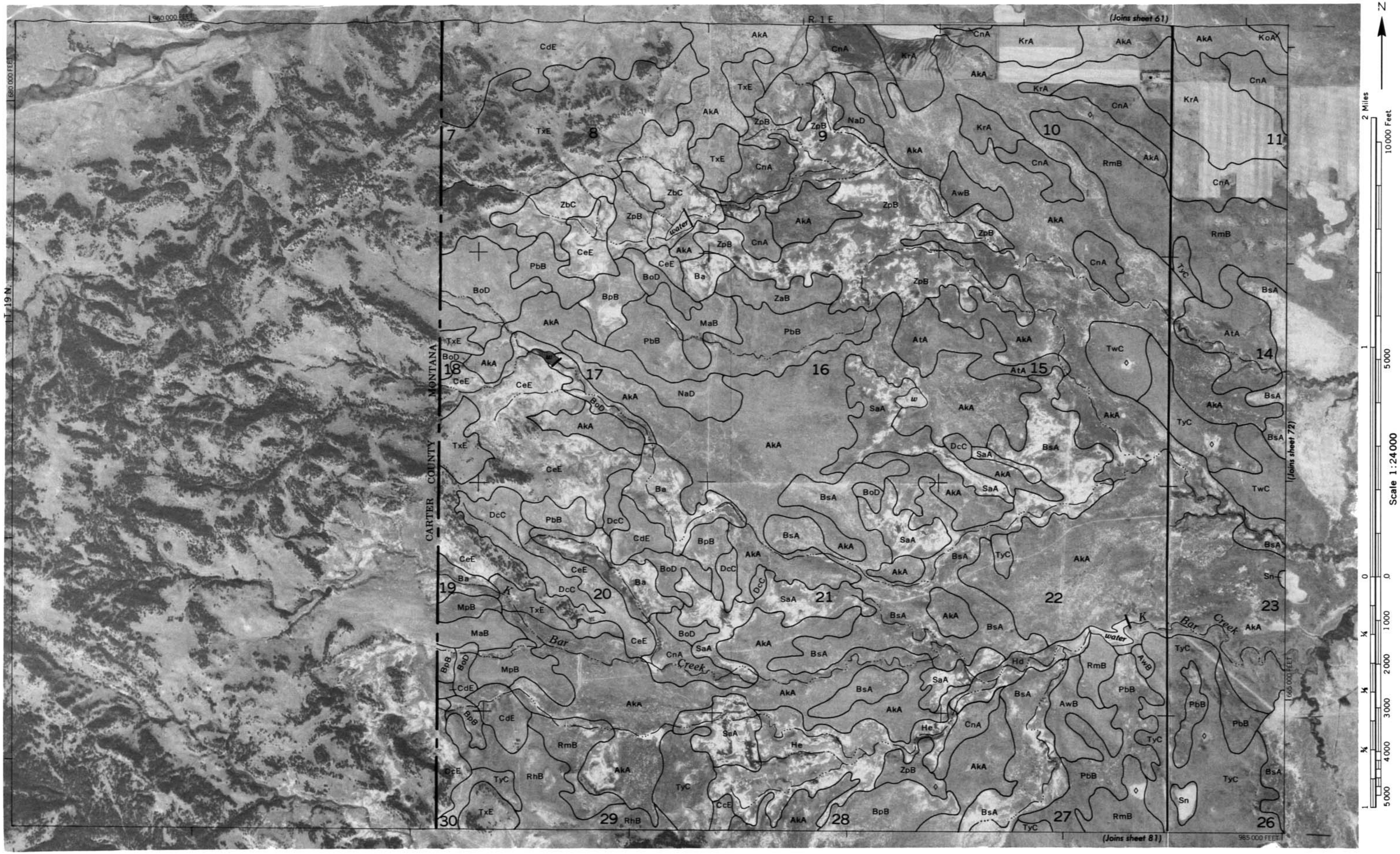


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

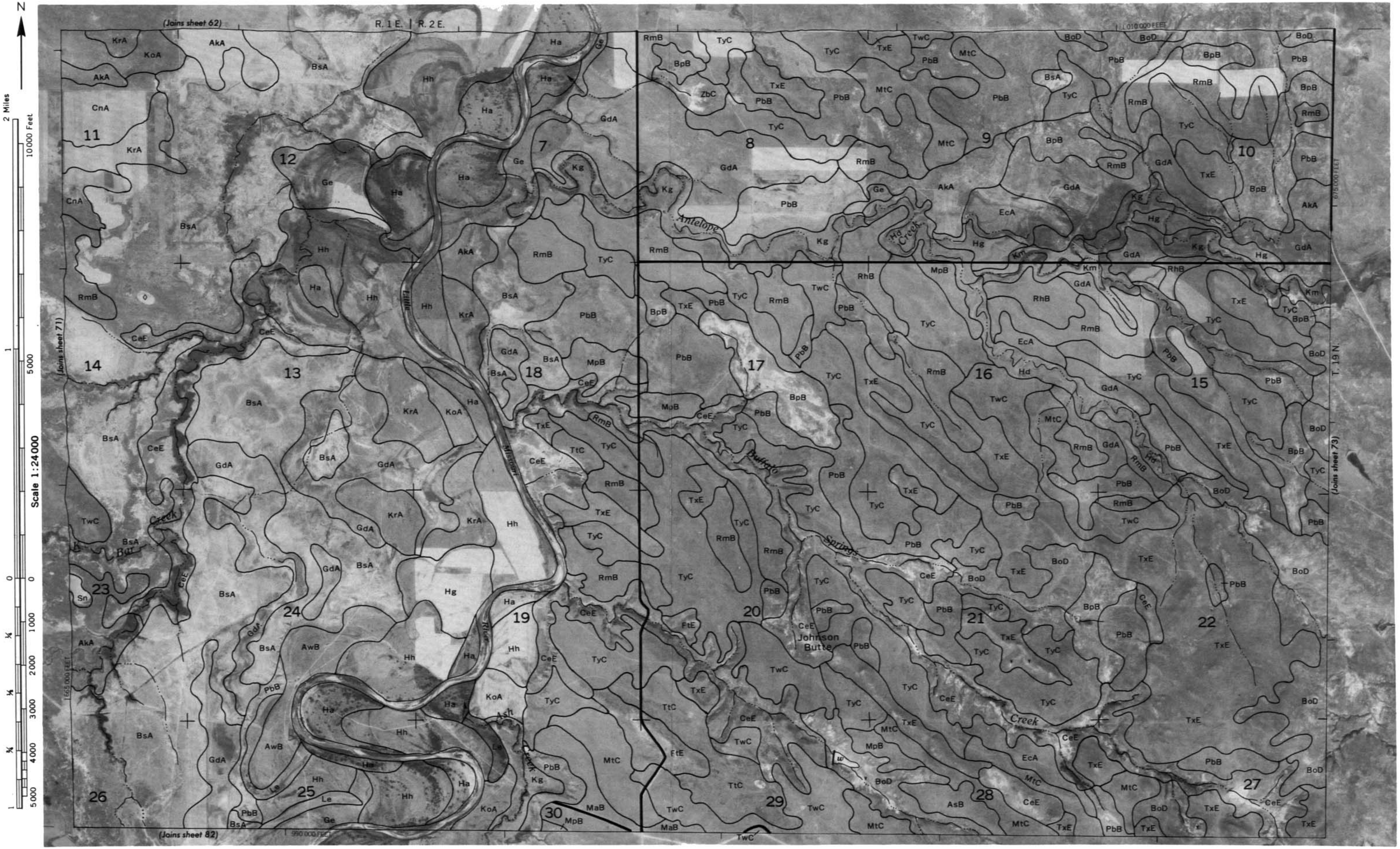
HARDING COUNTY, SOUTH DAKOTA NO. 70

HARDING COUNTY, SOUTH DAKOTA NO. 71

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



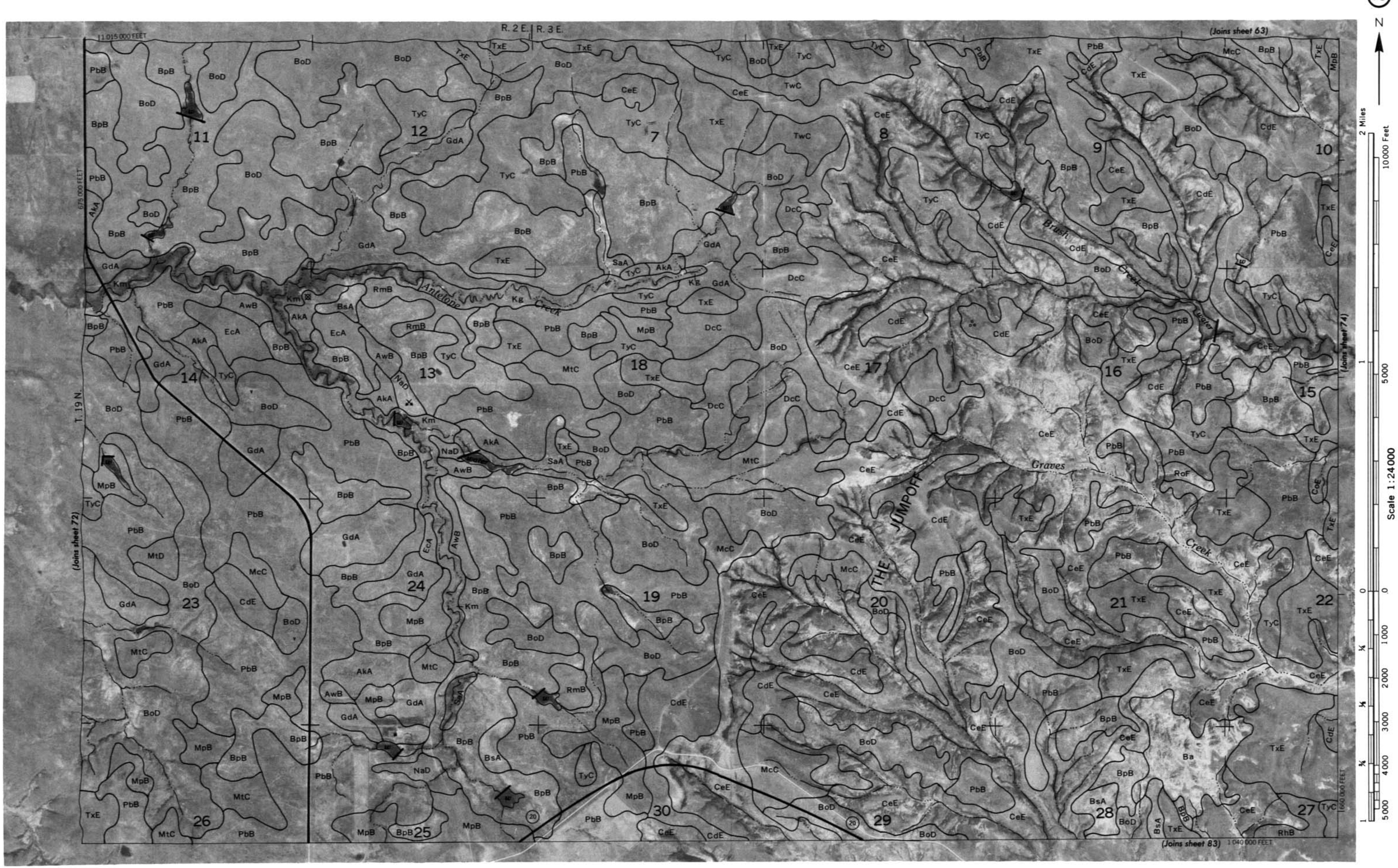
72



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

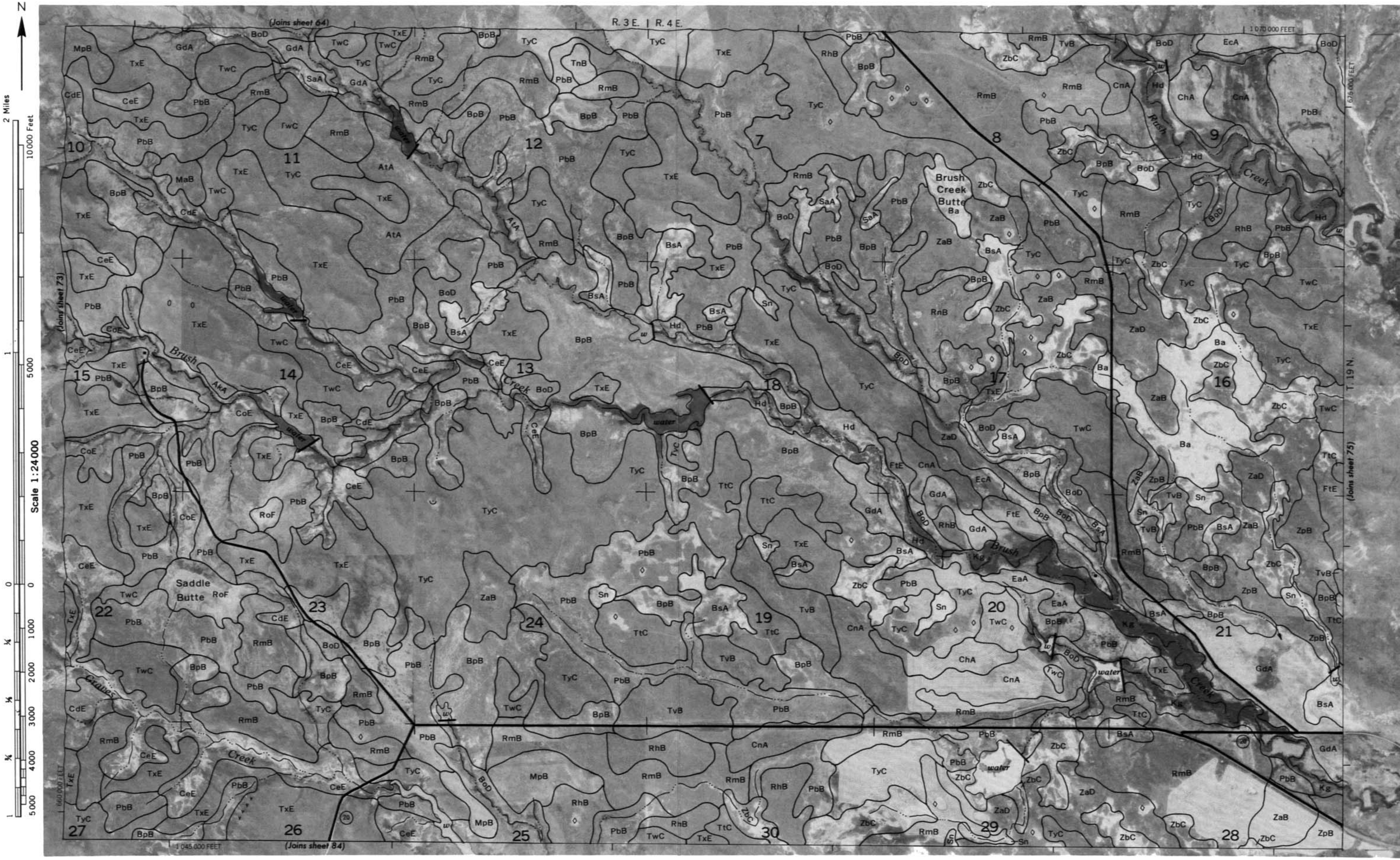
HARDING COUNTY, SOUTH DAKOTA NO. 72

73



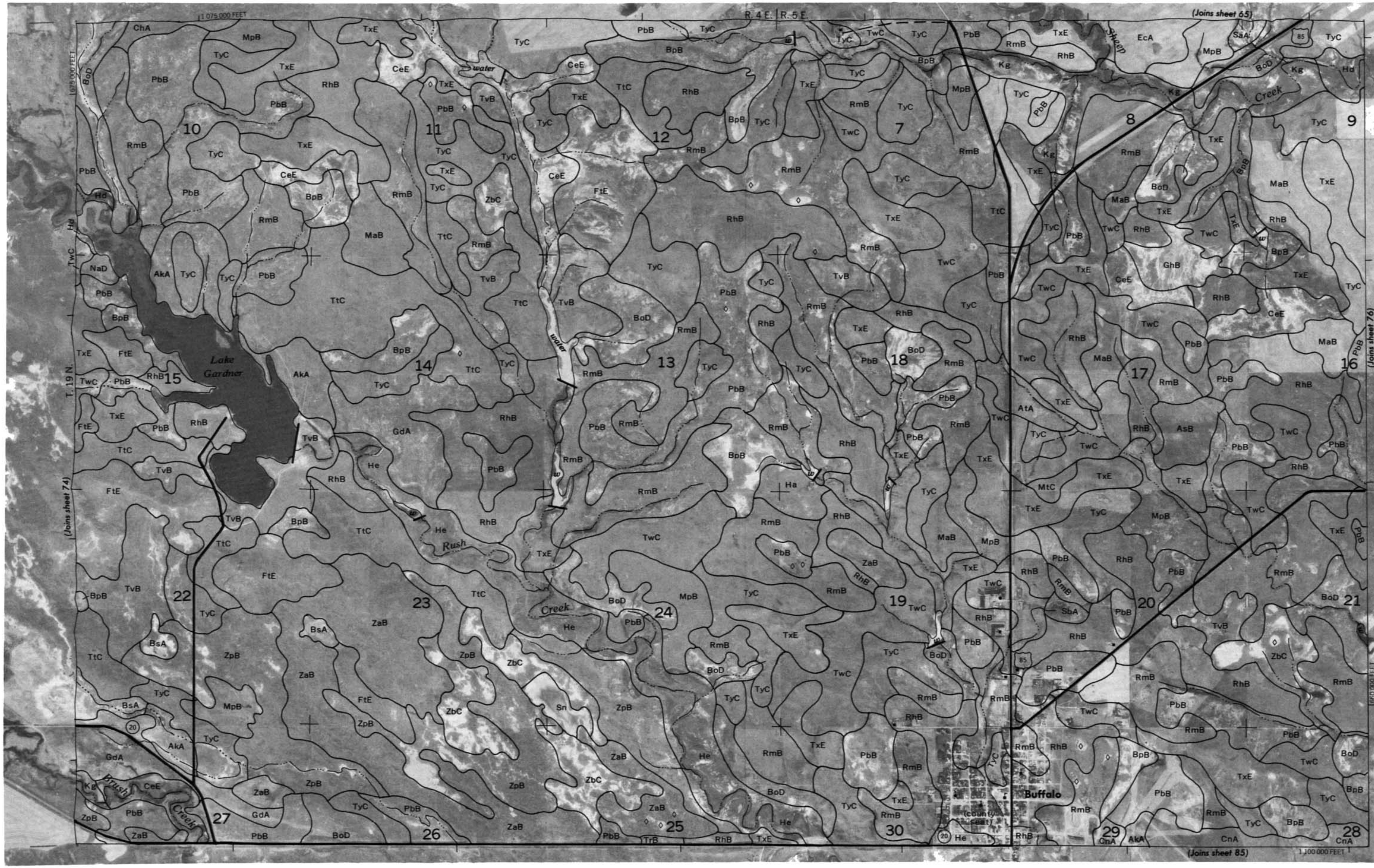
HARDING COUNTY, SOUTH DAKOTA NO. 73

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

75



N

Scale 1:24 000

2 Miles
10000 Feet
1
5000
0
1000
2000
3000
4000
5000

HARDING COUNTY, SOUTH DAKOTA NO. 75

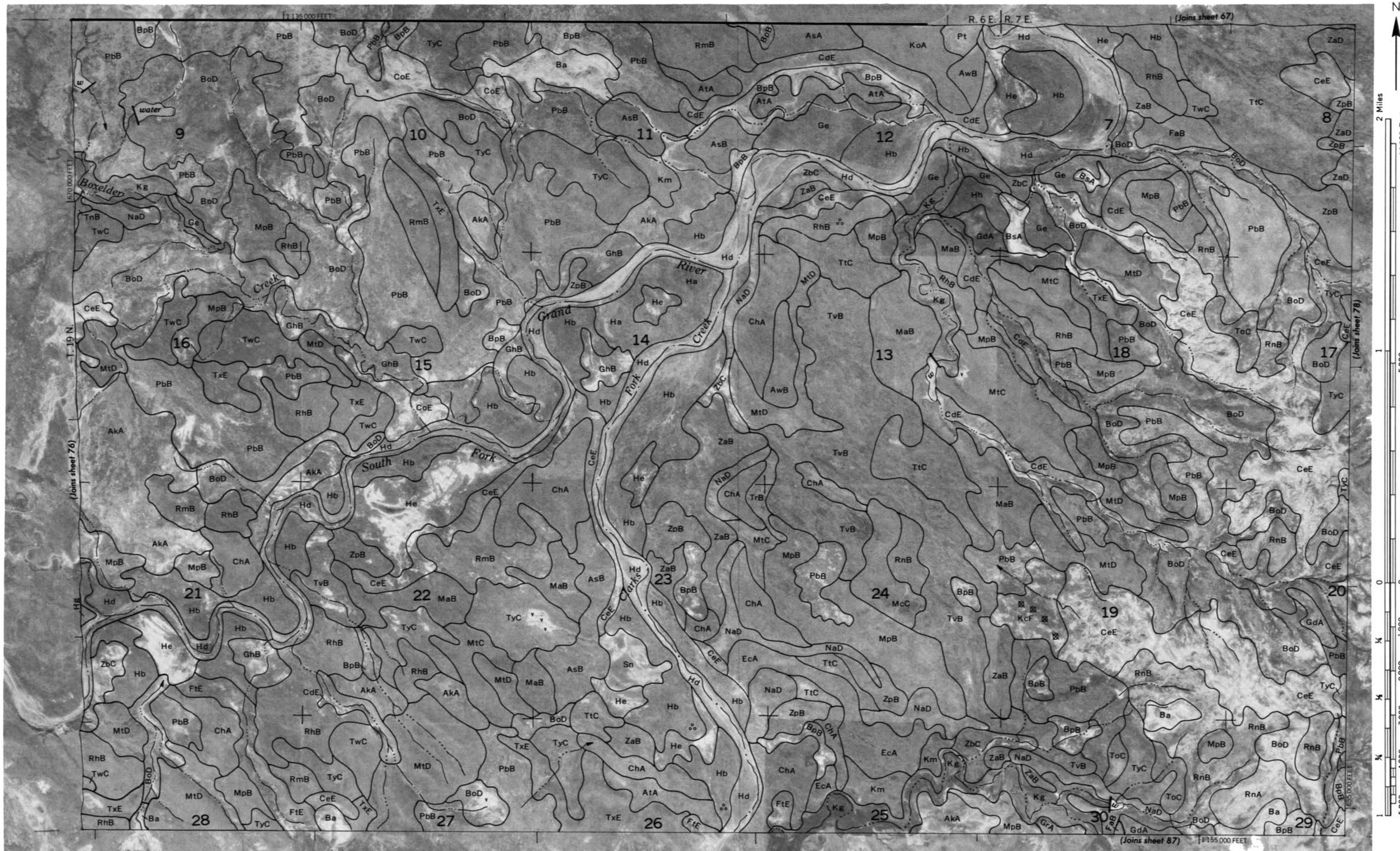
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA — SHEET NUMBER 76

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

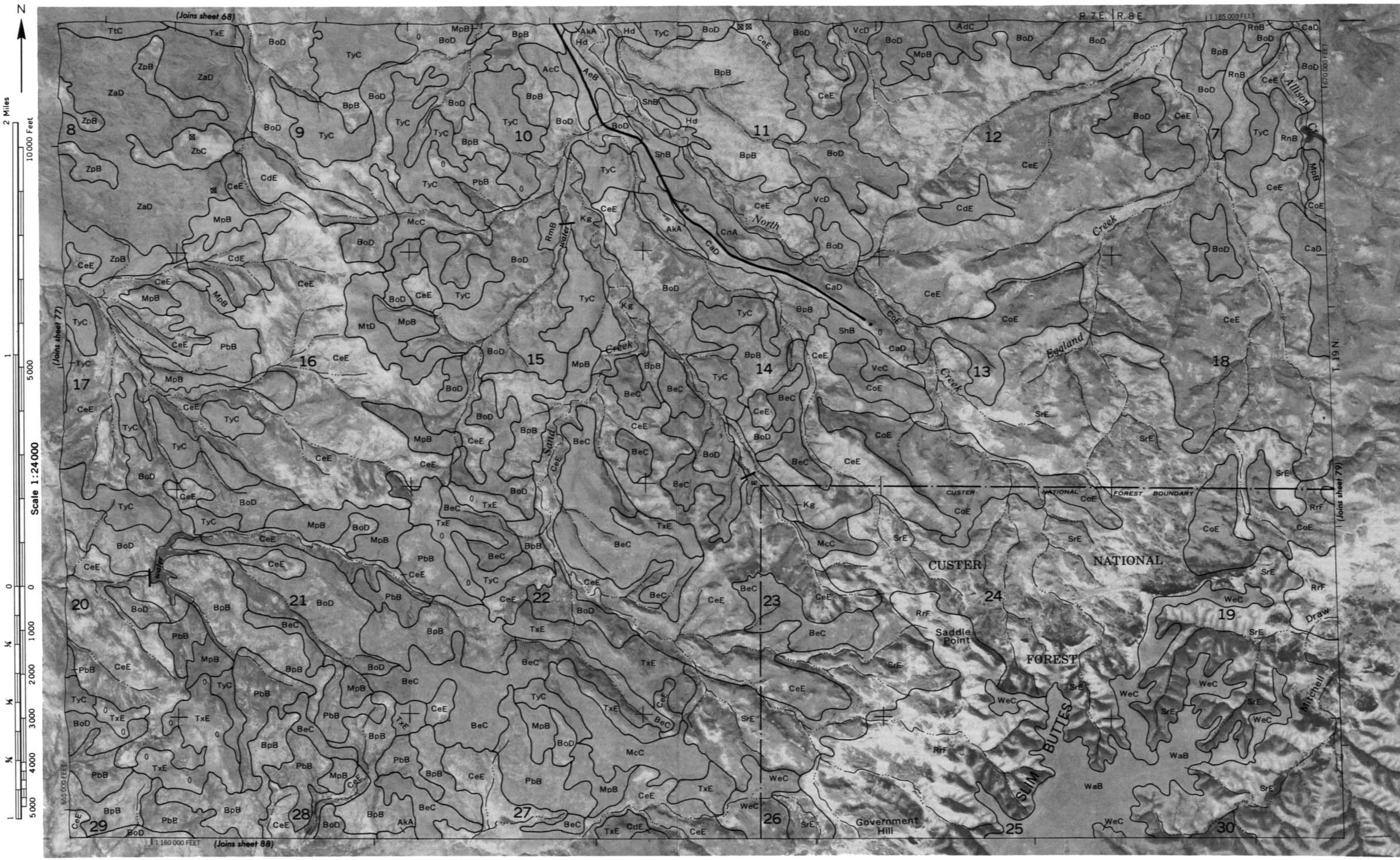
HARDING COUNTY, SOUTH DAKOTA NO. 76

77



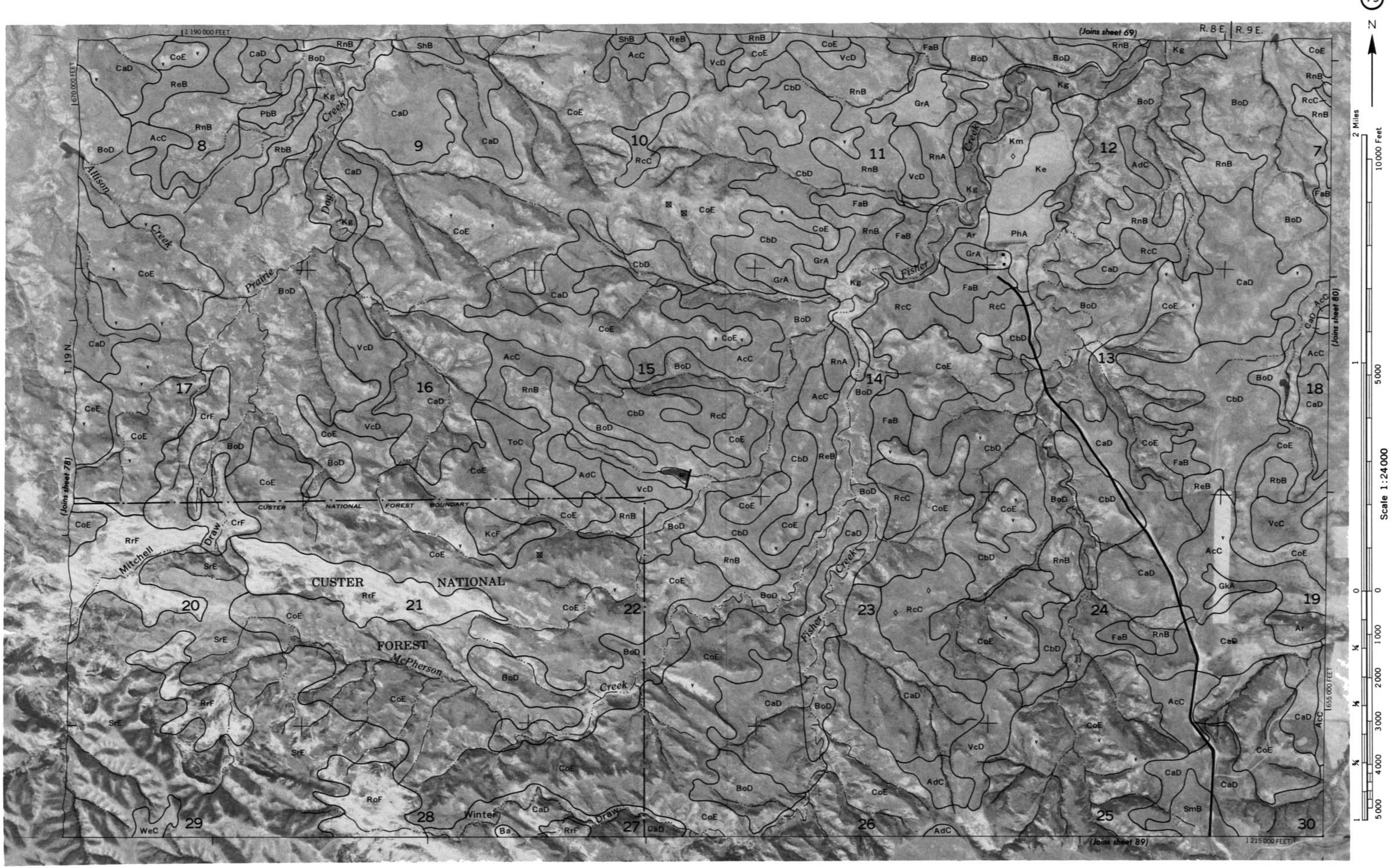
HARDING COUNTY, SOUTH DAKOTA NO. 77

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



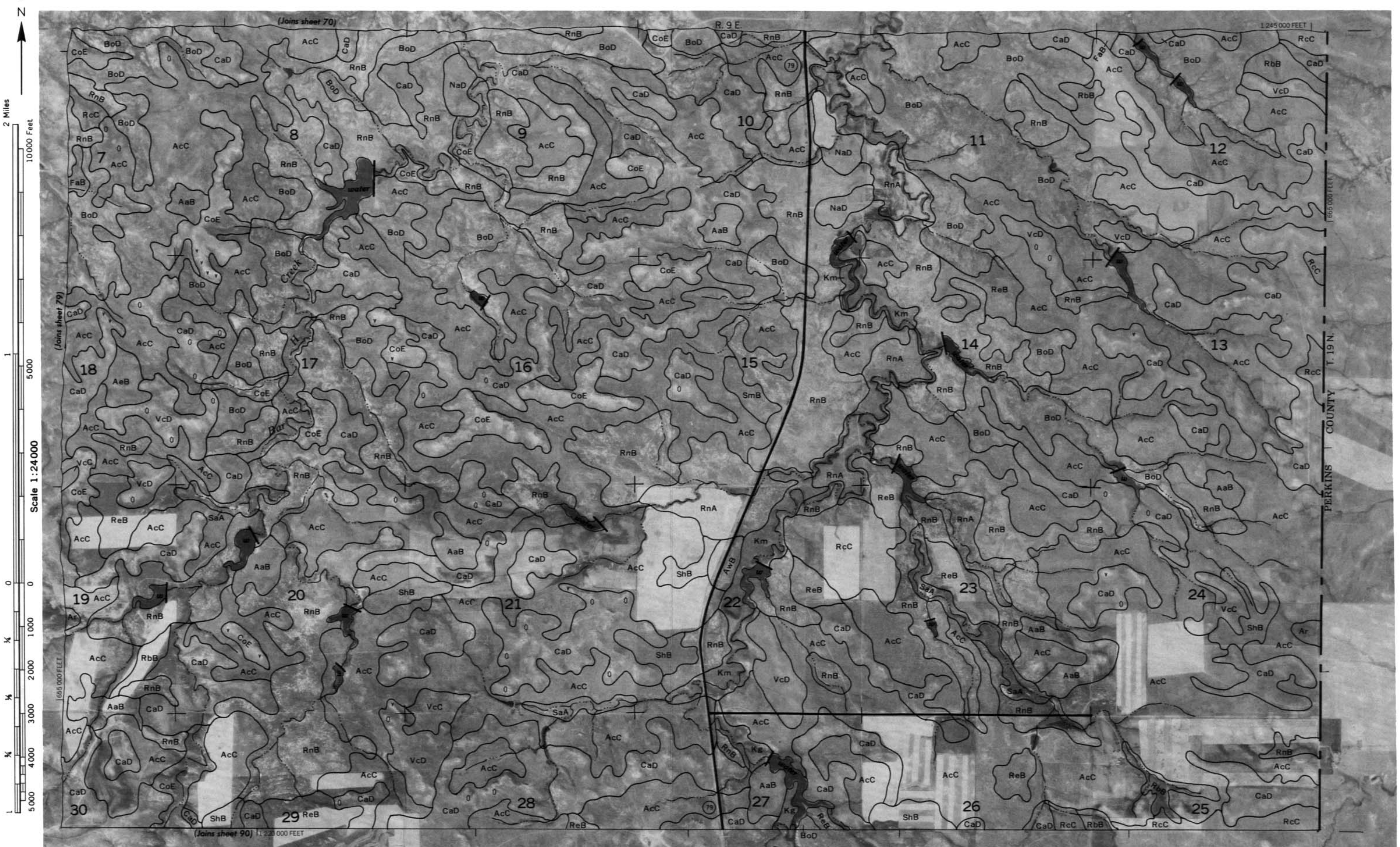
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 78



HARDING COUNTY, SOUTH DAKOTA NO. 79

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 81

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

Scale 1:24000

2 Miles

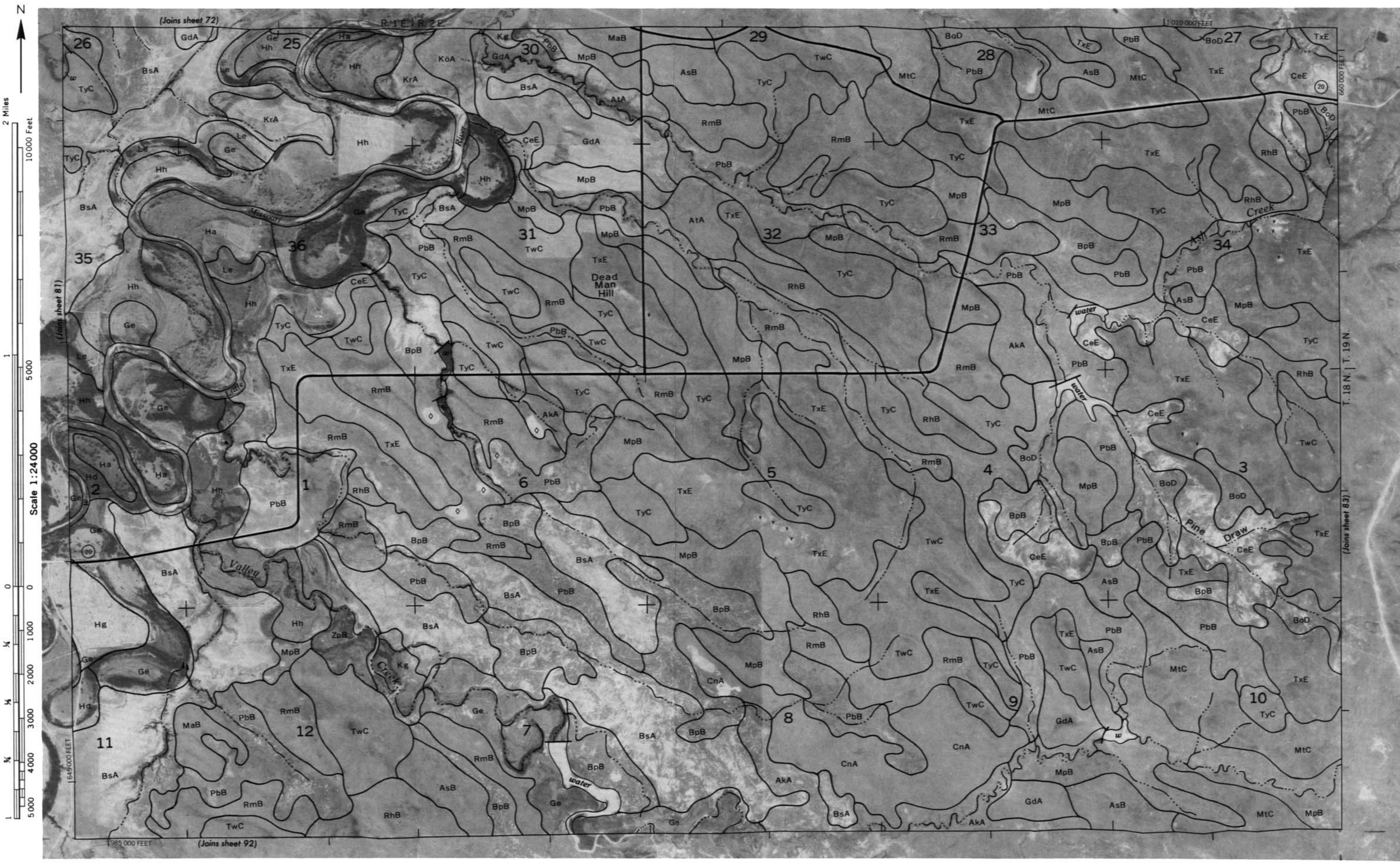
10000 Feet

1

5000

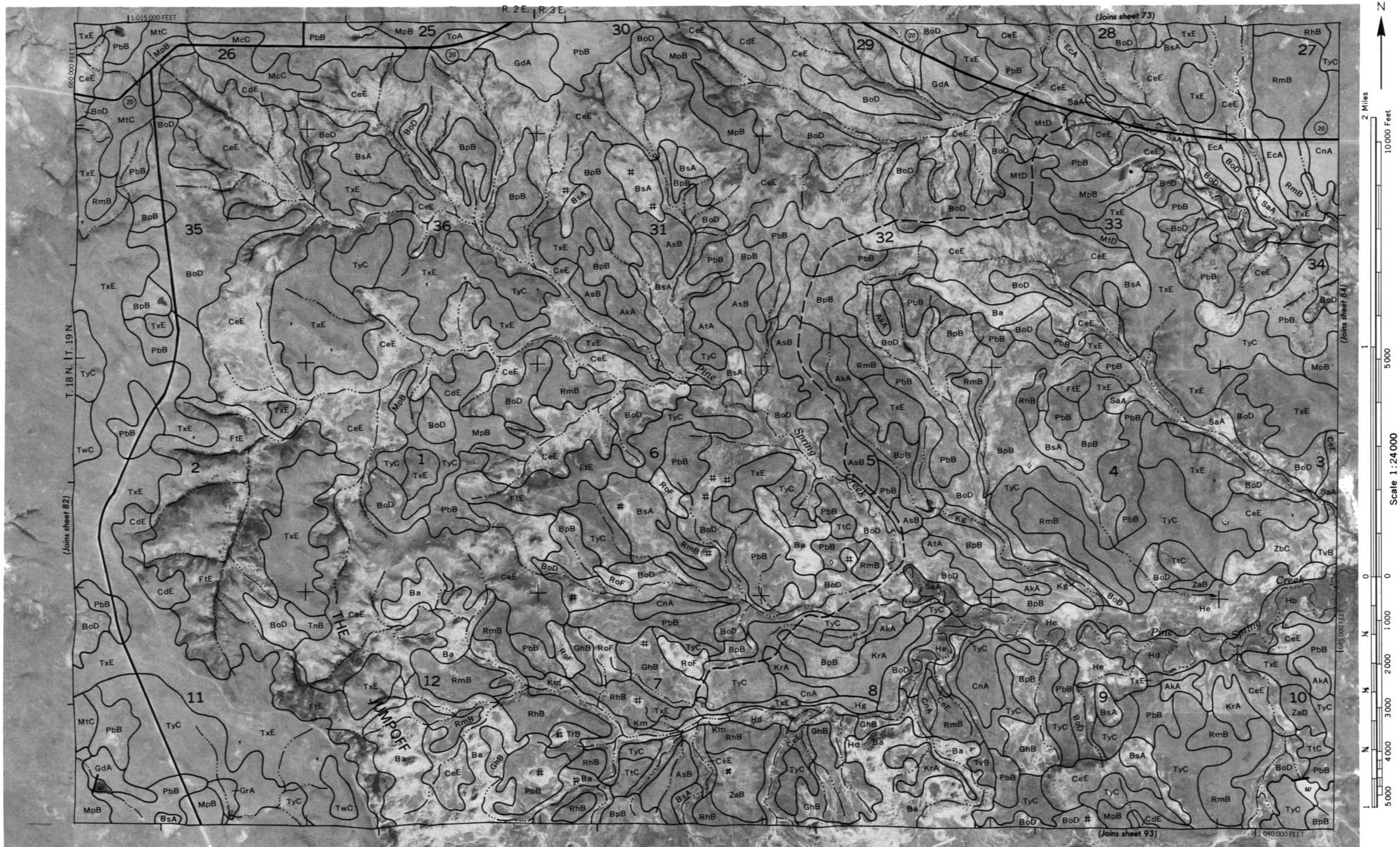
0

0



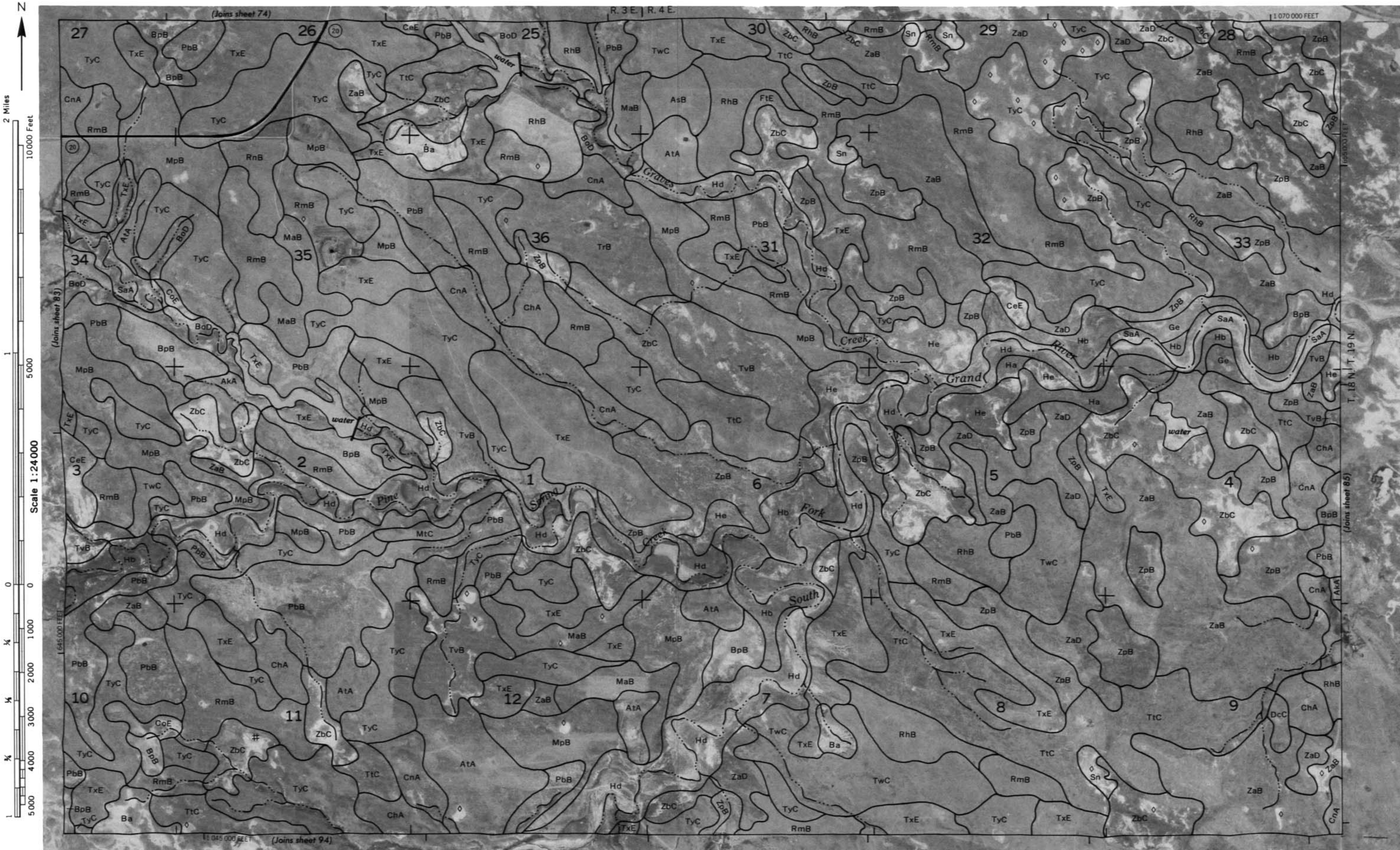
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 82



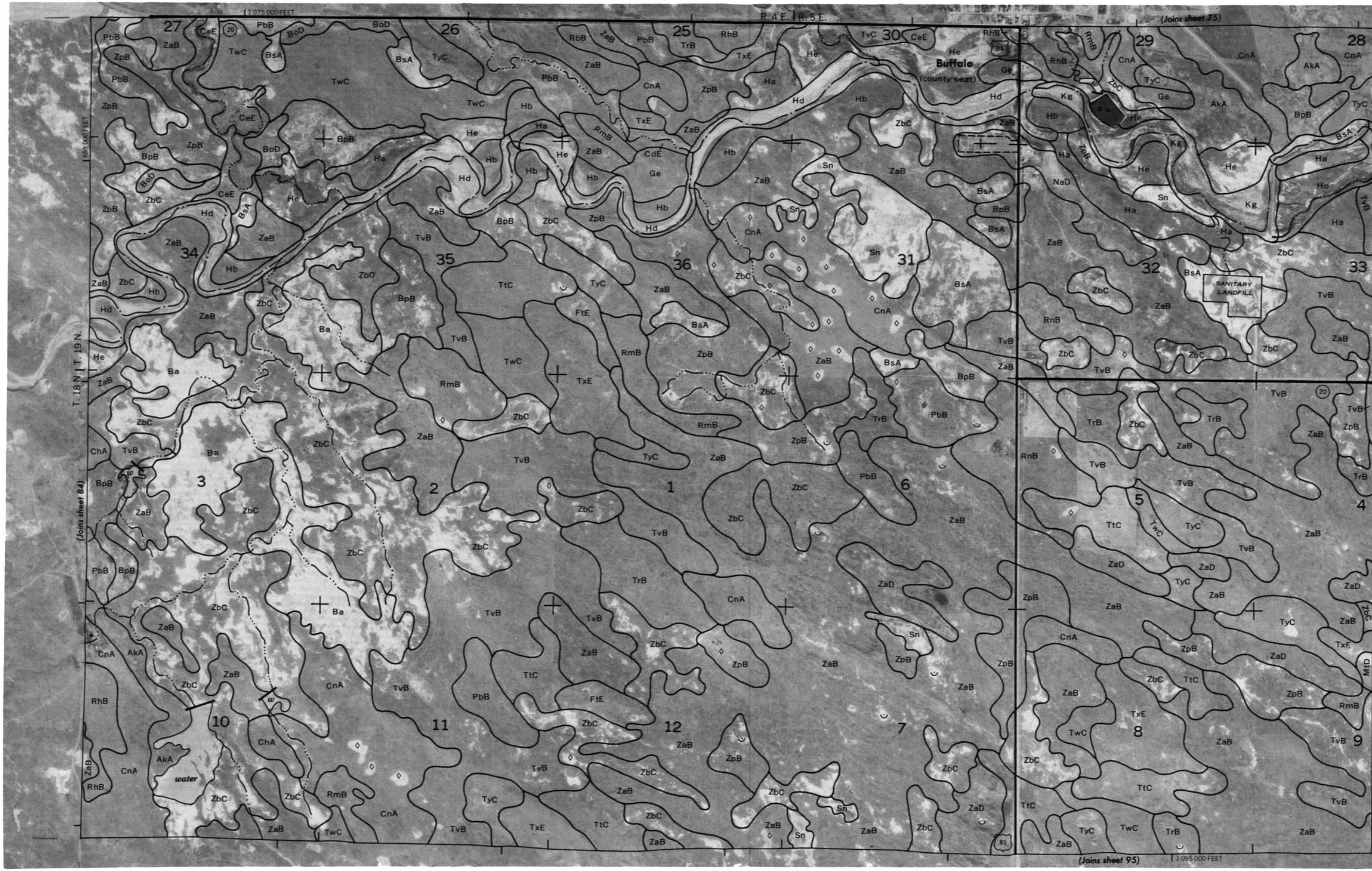
HARDING COUNTY, SOUTH DAKOTA NO. 83

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 84



HARDING COUNTY, SOUTH DAKOTA NO. 85

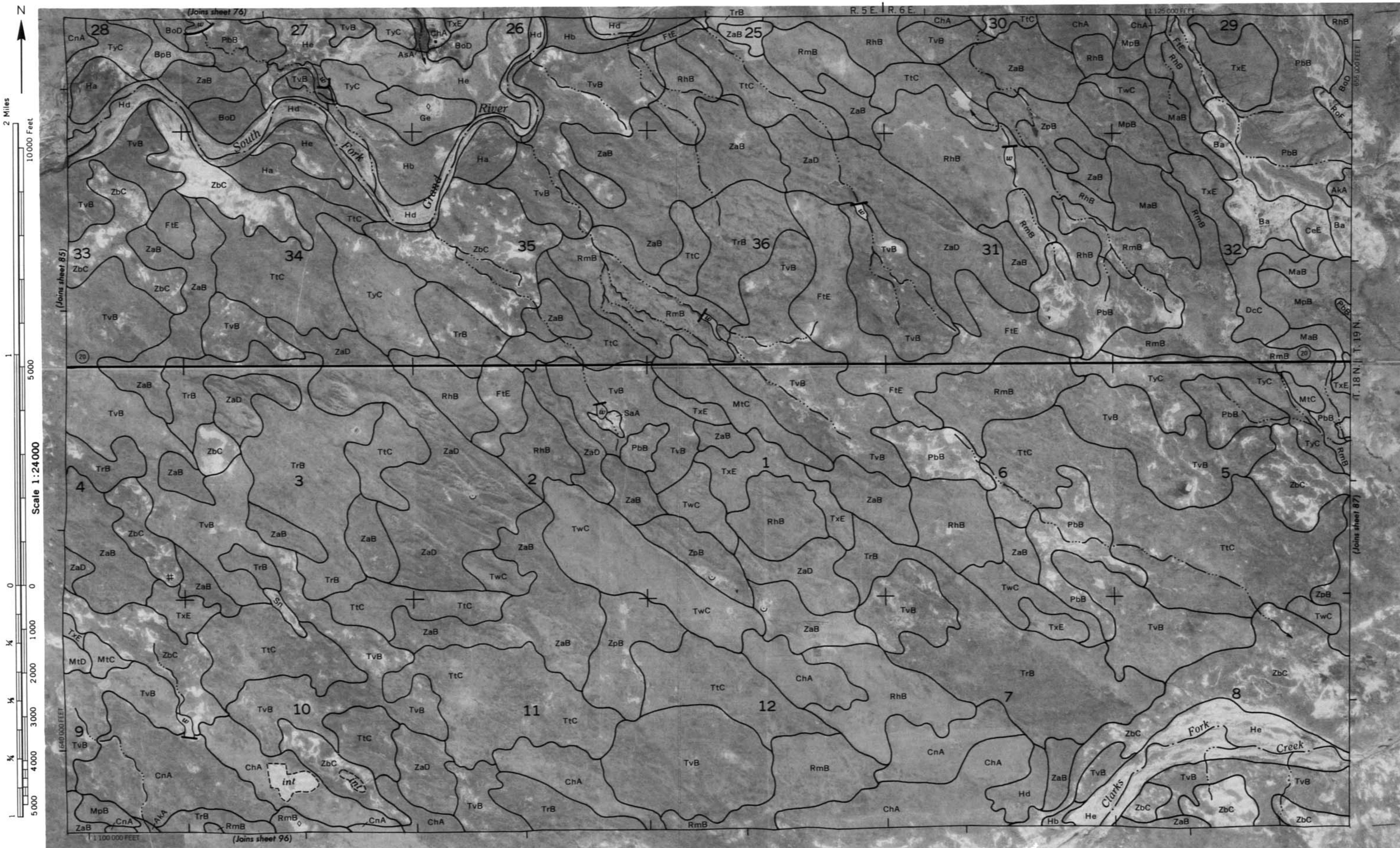
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

Scale 1:24 000

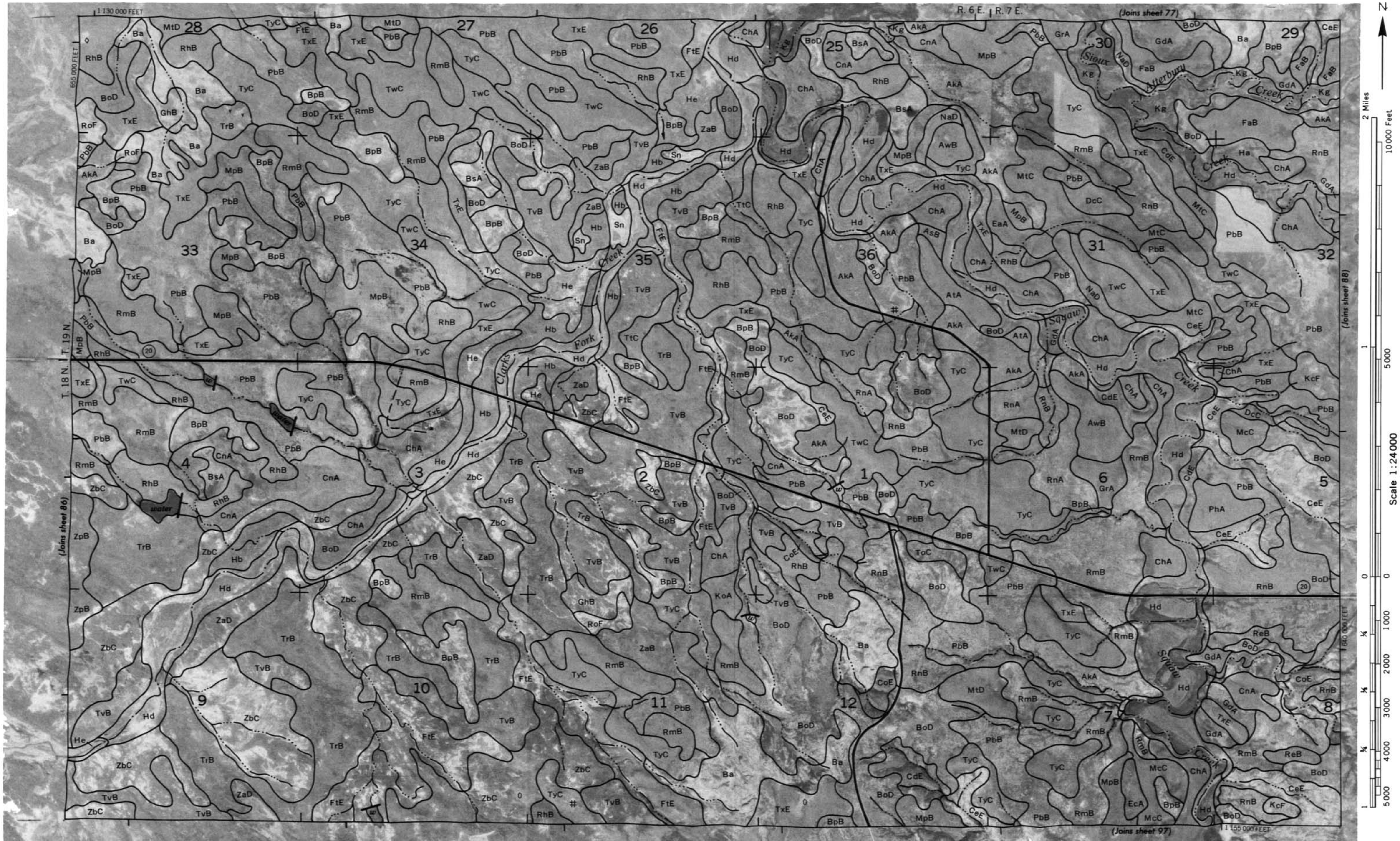
2 Miles
10000 Feet

HARDING COUNTY, SOUTH DAKOTA — SHEET NUMBER 86



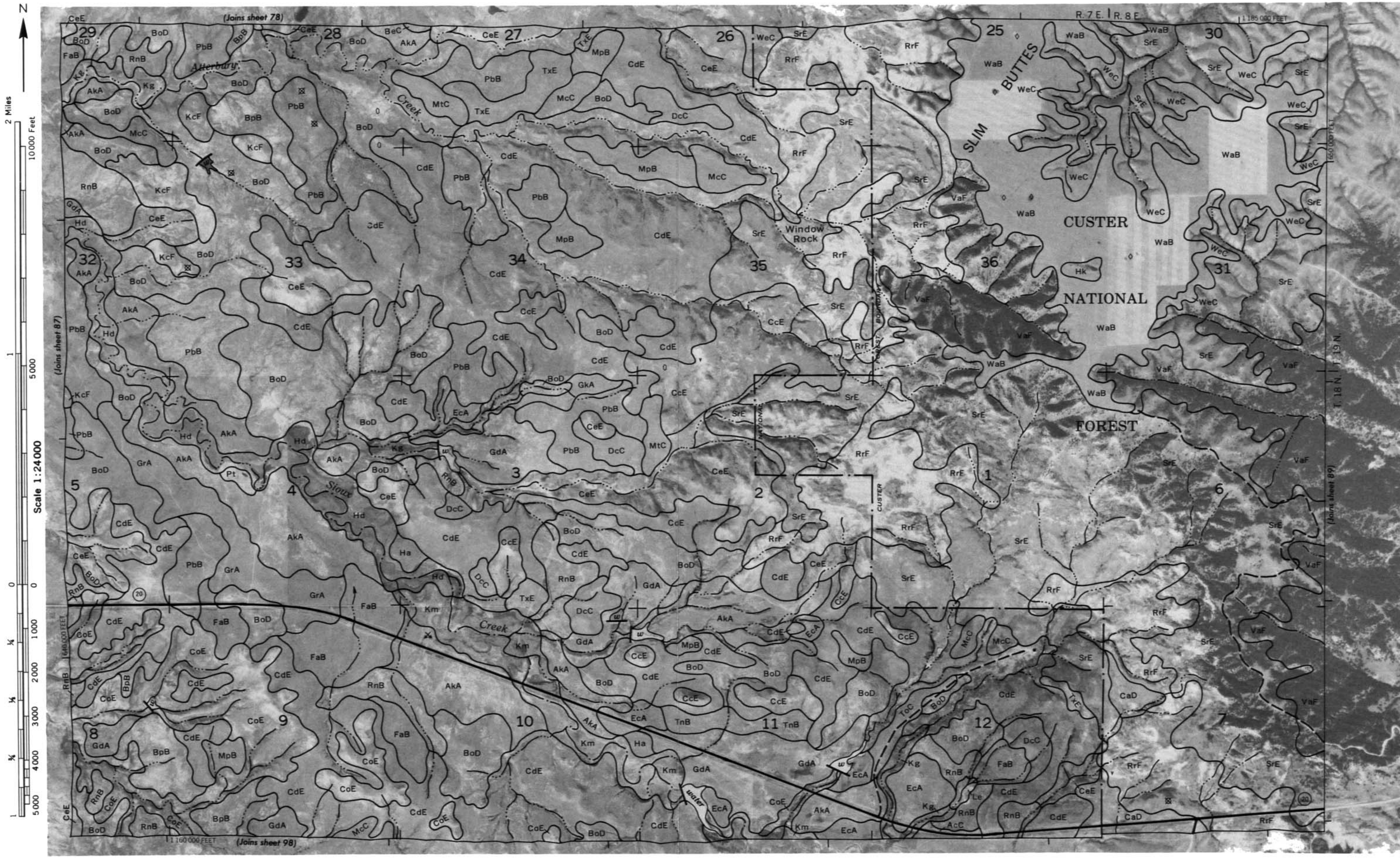
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 86



HARDING COUNTY, SOUTH DAKOTA NO. 87

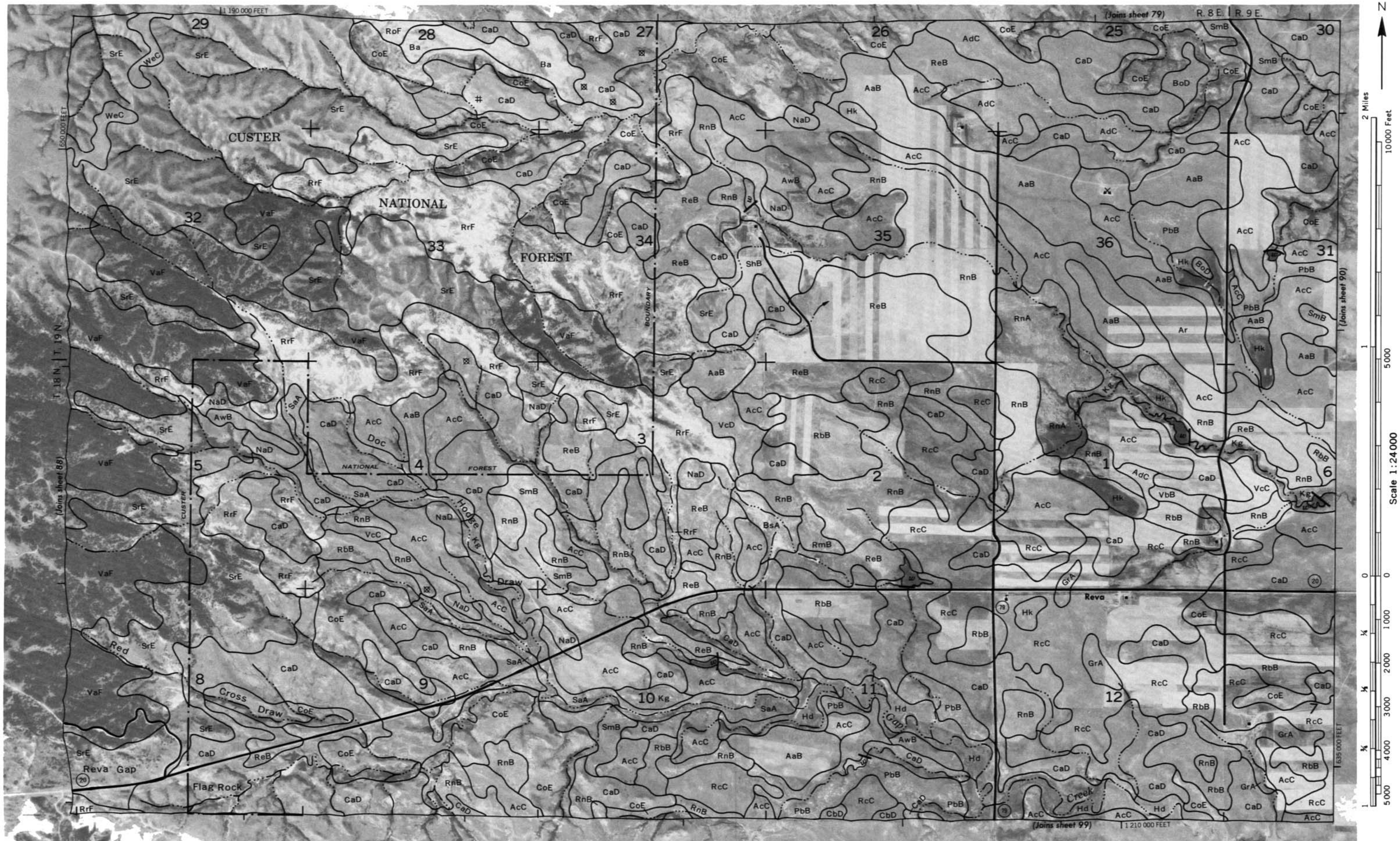
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 89

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



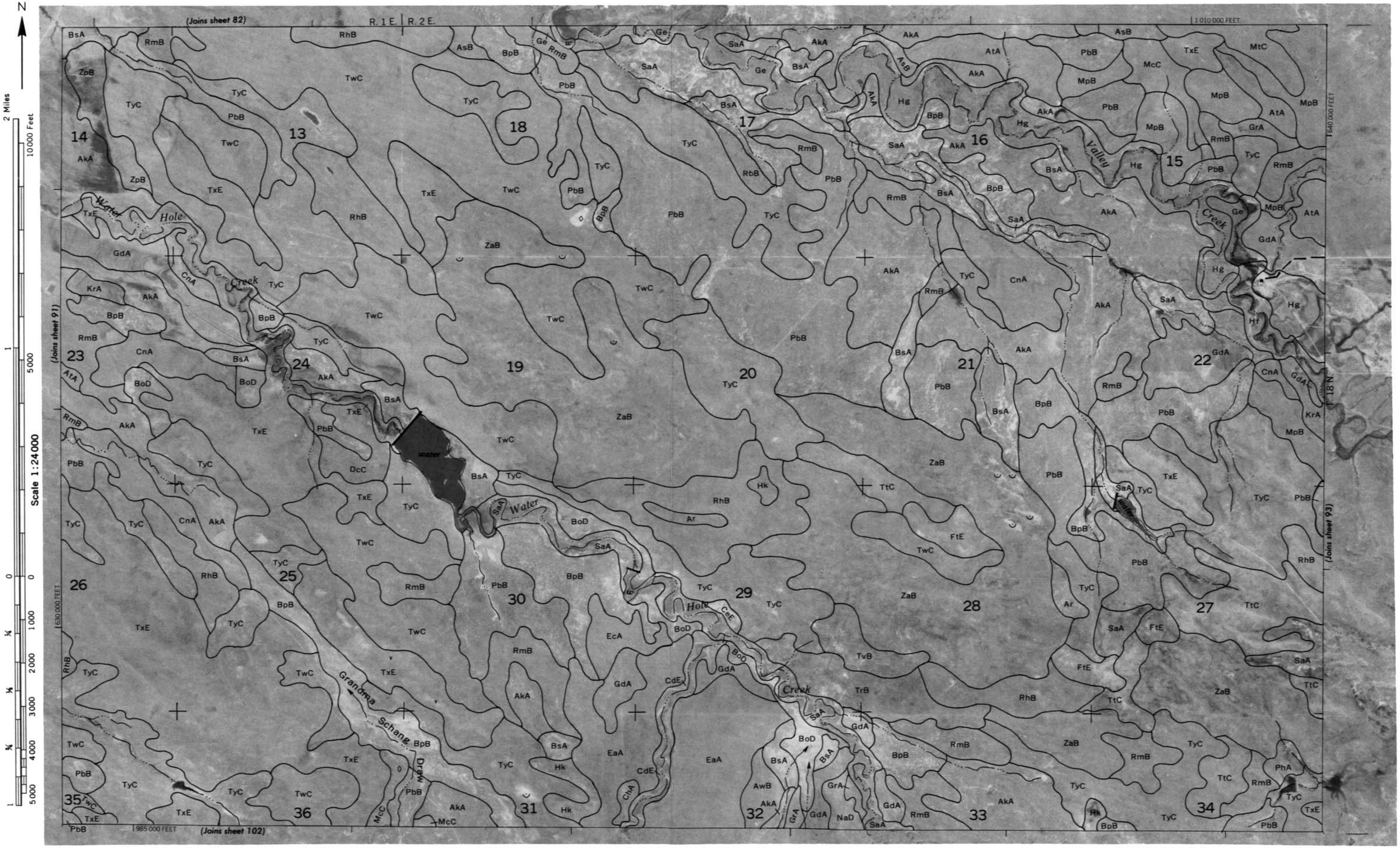
HARDING COUNTY, SOUTH DAKOTA — SHEET NUMBER 90

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 91

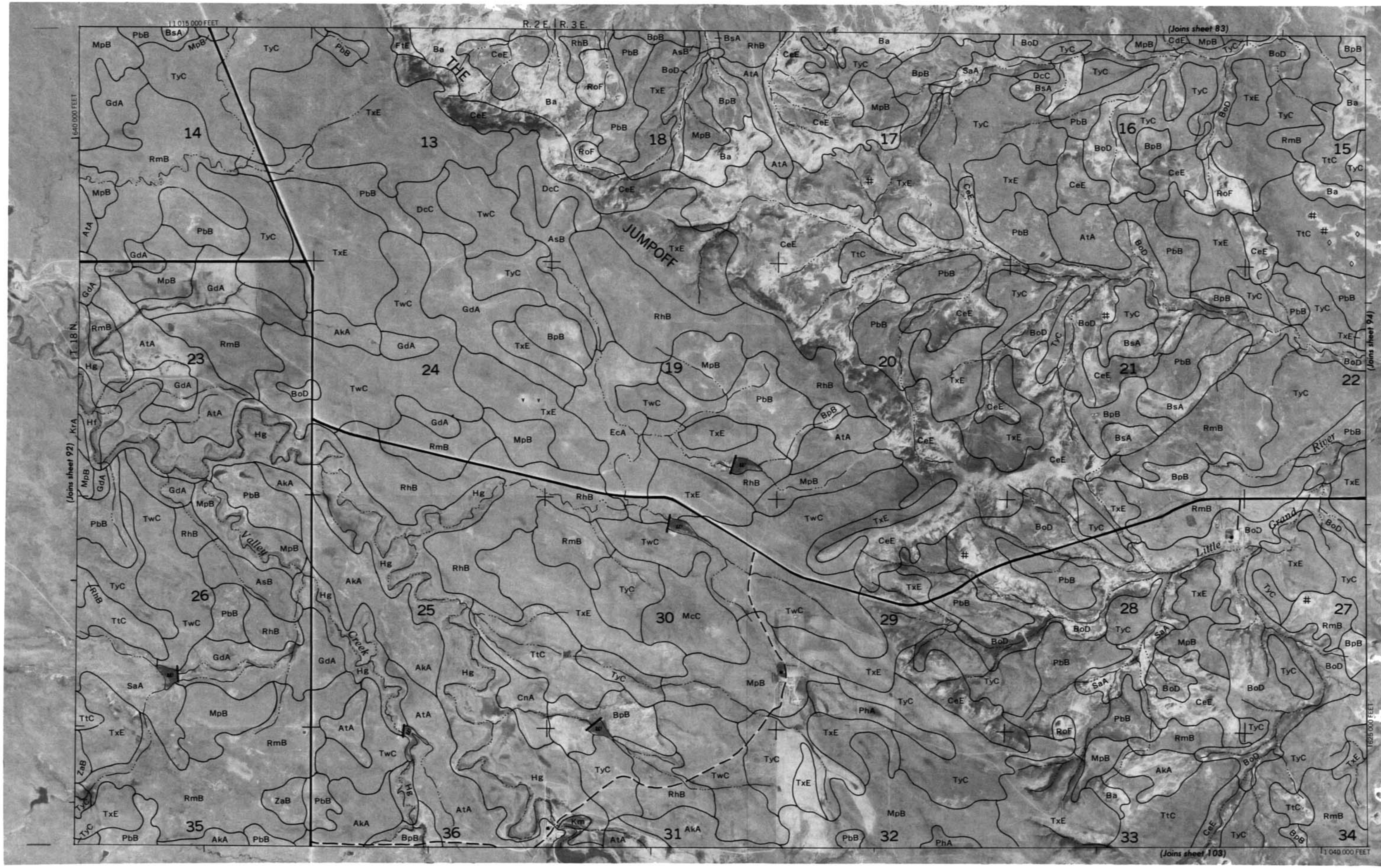
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA — SHEET NUMBER 92



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

93



N

Scale 1:24000

2 Miles 1 0

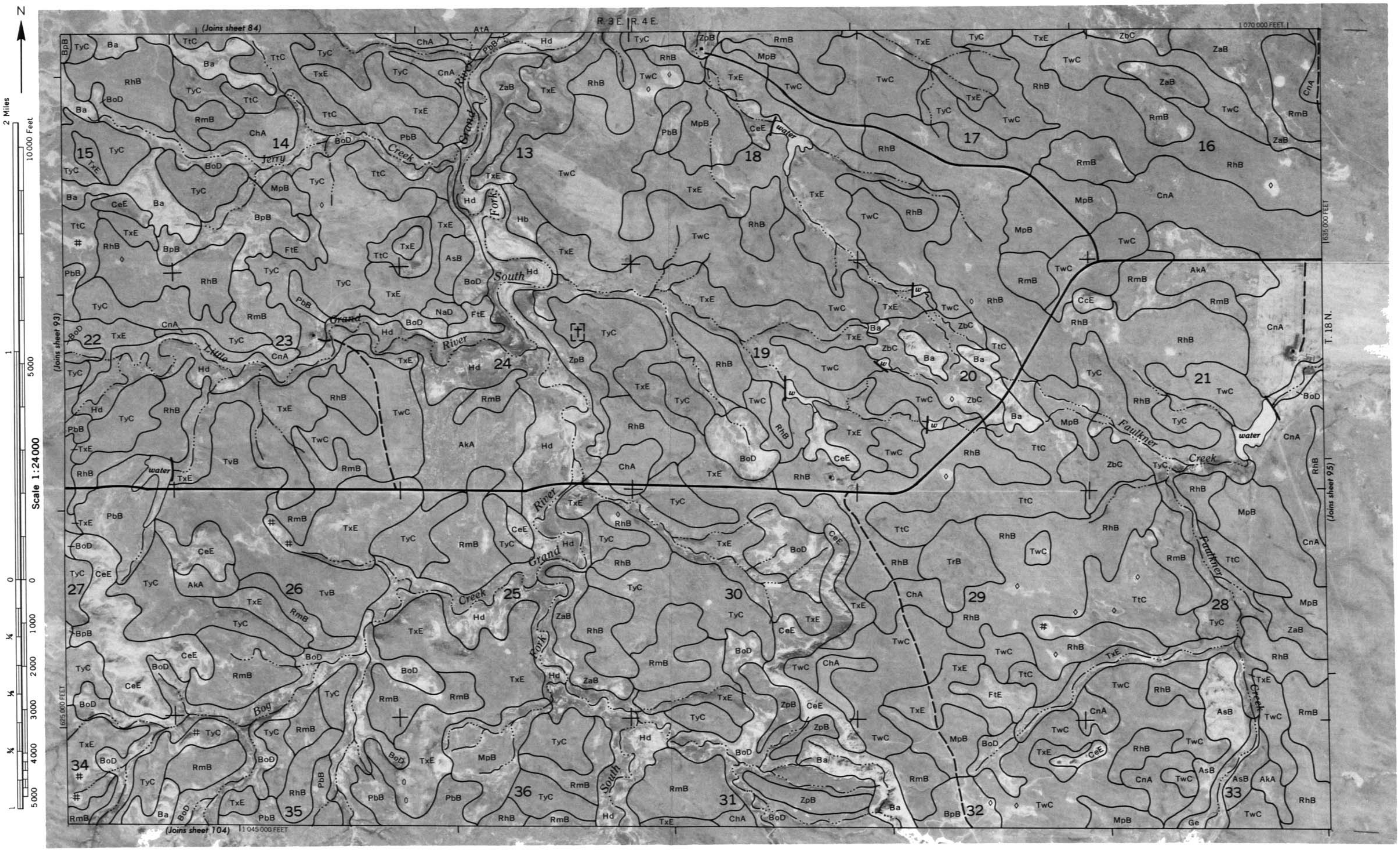
10000 Feet 5000 0

1 Kilometer ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0 Meters

HARDING COUNTY, SOUTH DAKOTA NO. 93

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



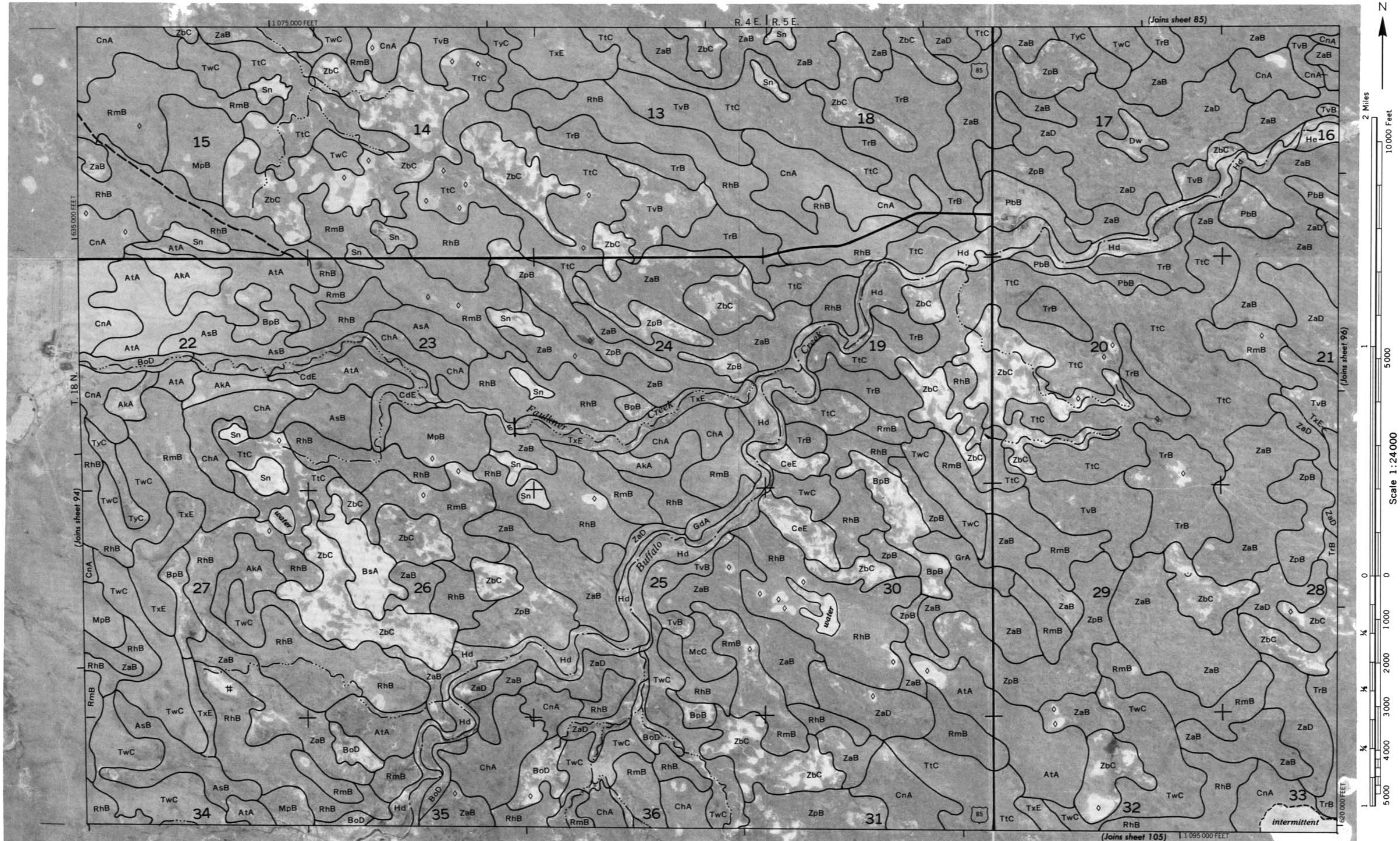
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

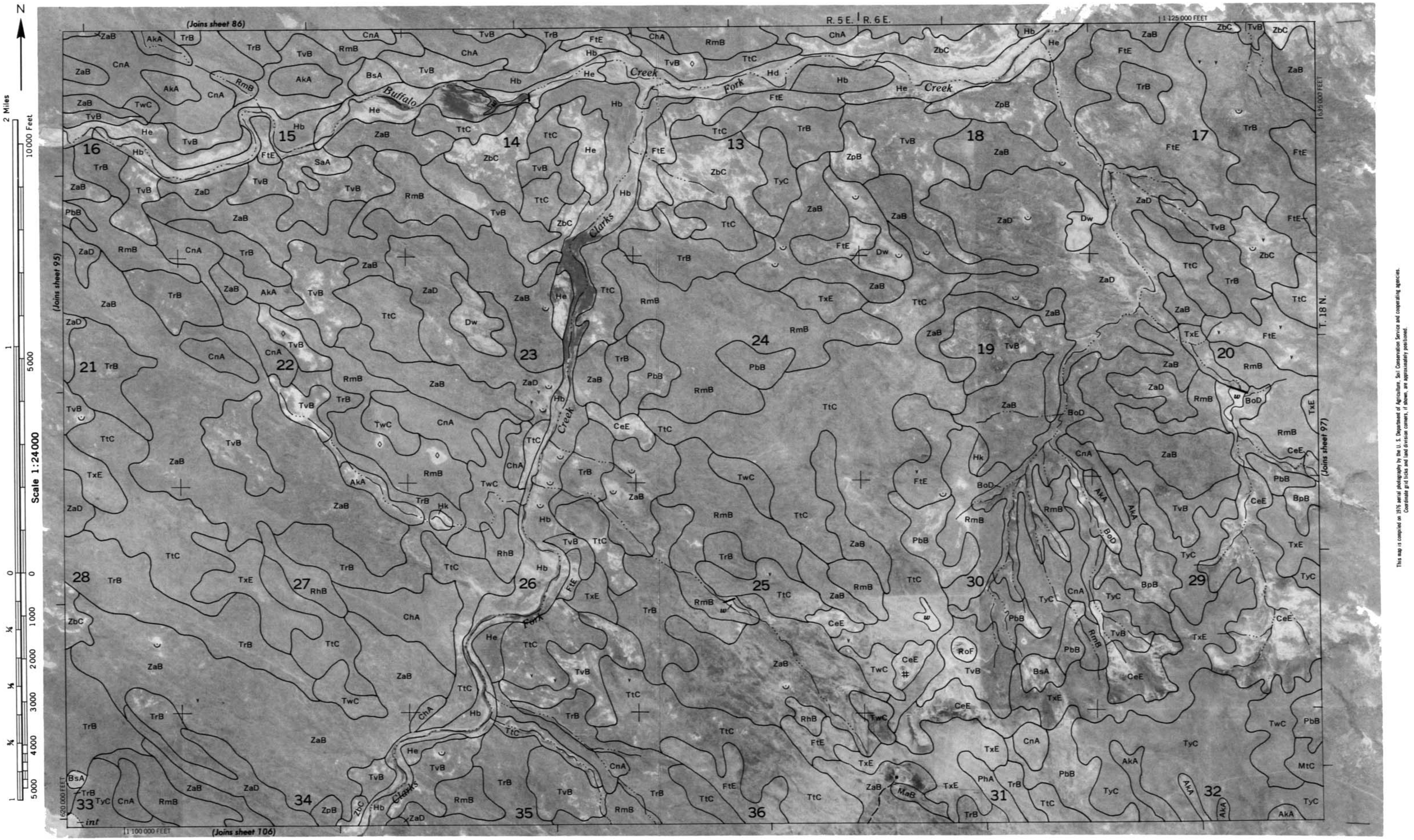
HARDING COUNTY, SOUTH DAKOTA NO. 94

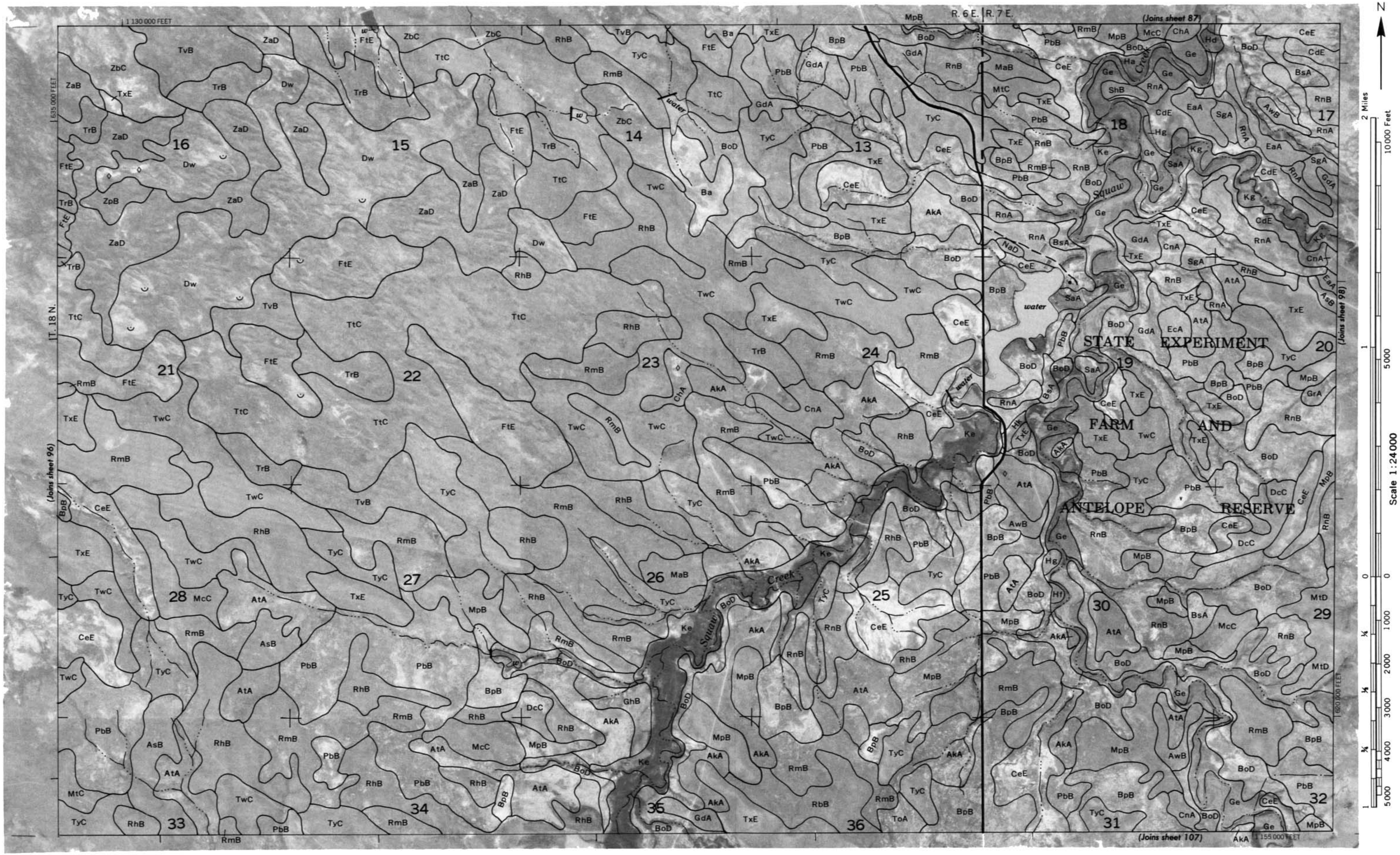
95

HARDING COUNTY, SOUTH DAKOTA NO. 95

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



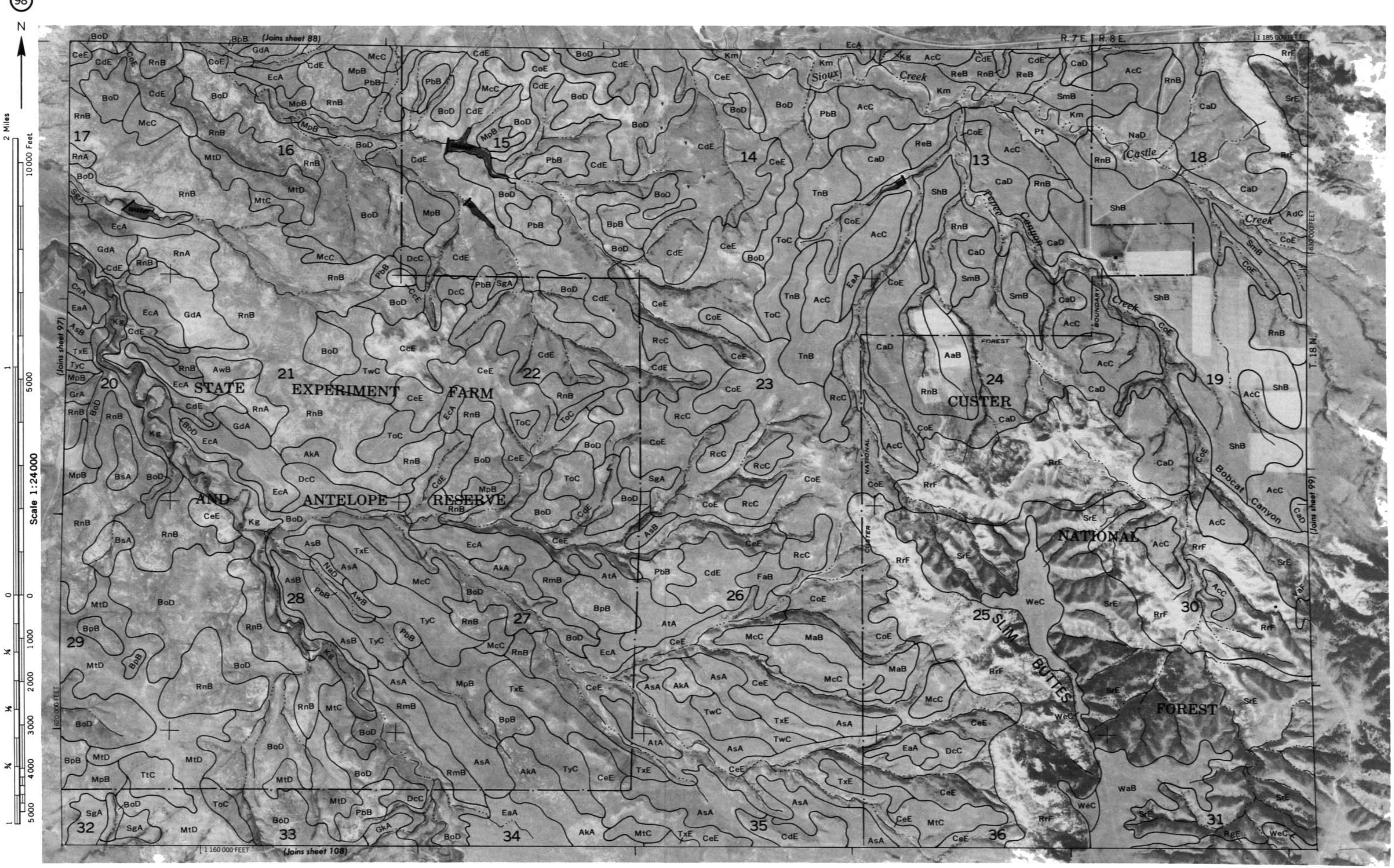

96
N
(Joins sheet 86)
R. 5 E. | R. 6 E.
1 125 000 FEET
(Joins sheet 95)
(Joins sheet 97)
(Joins sheet 106)
T. 18 N.
1 100 000 FEET
620 000 FEET
635 000 FEET
Buffalo
Creek
Fork
Clarks
Scale 1:24000
2 Miles
10000 Feet
5000
1
0
1000
2000
3000
4000
5000
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.
HARDING COUNTY, SOUTH DAKOTA NO. 96



HARDING COUNTY, SOUTH DAKOTA NO. 97

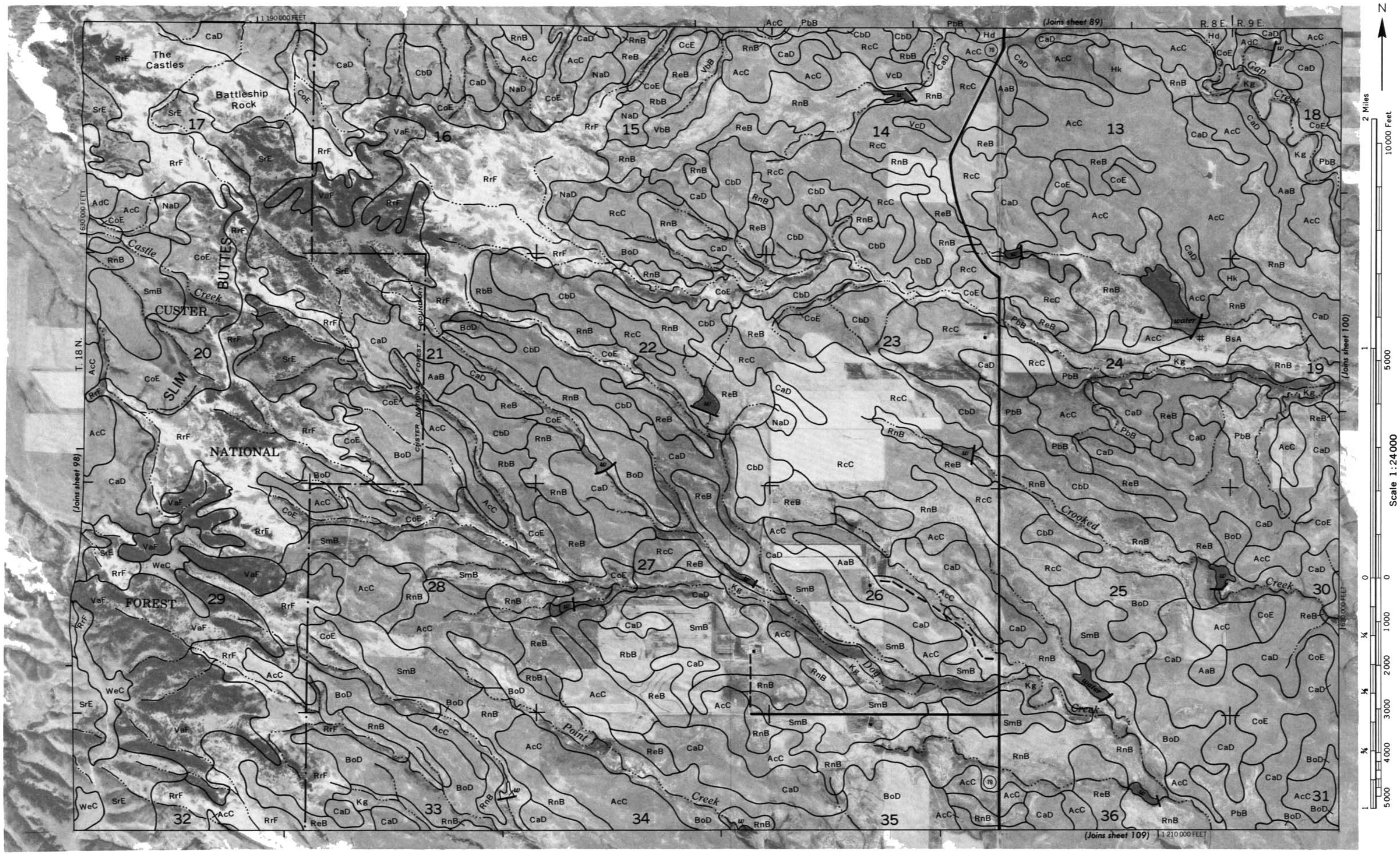
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA — SHEET NUMBER 98



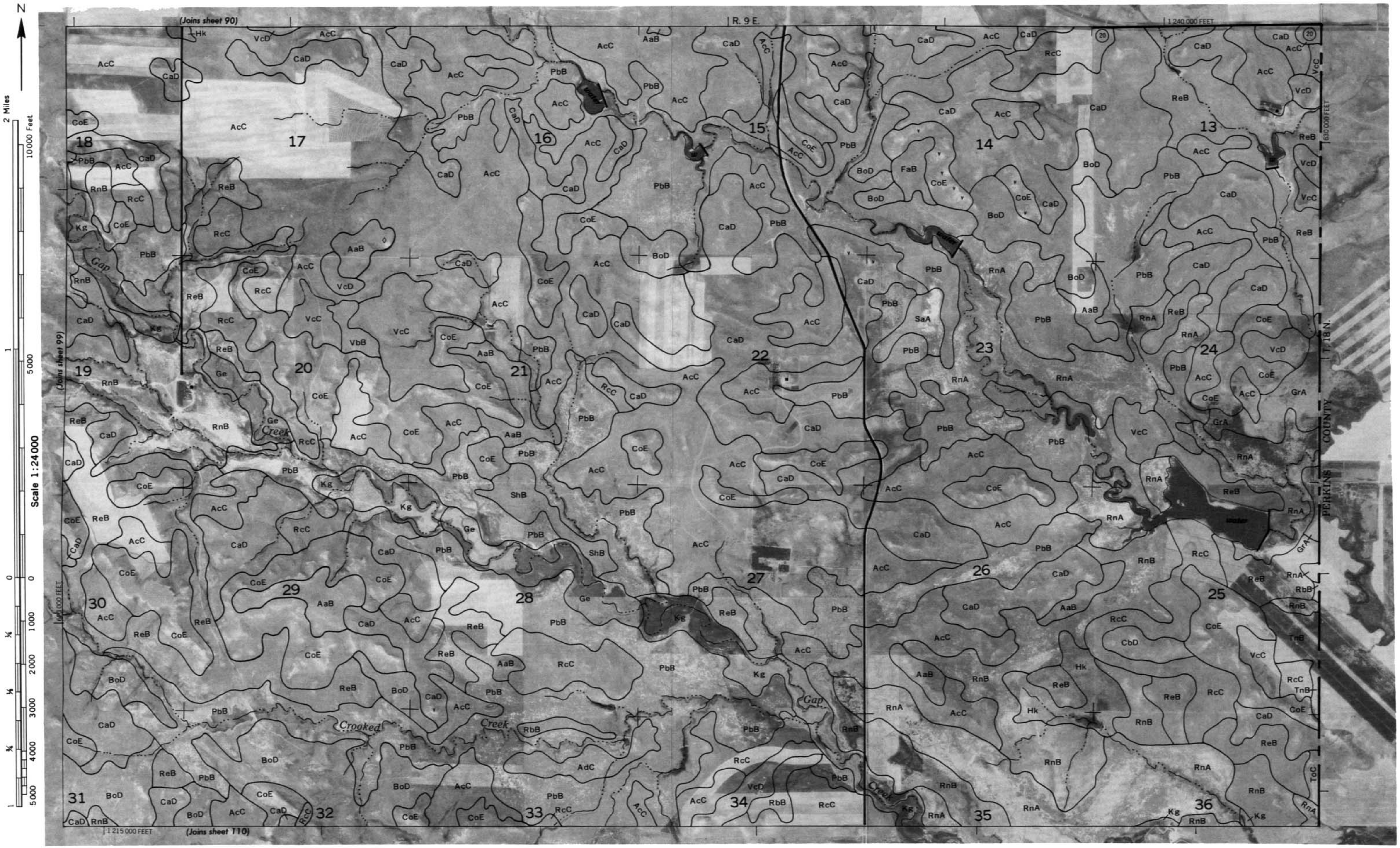
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

99



HARDING COUNTY, SOUTH DAKOTA NO. 99

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

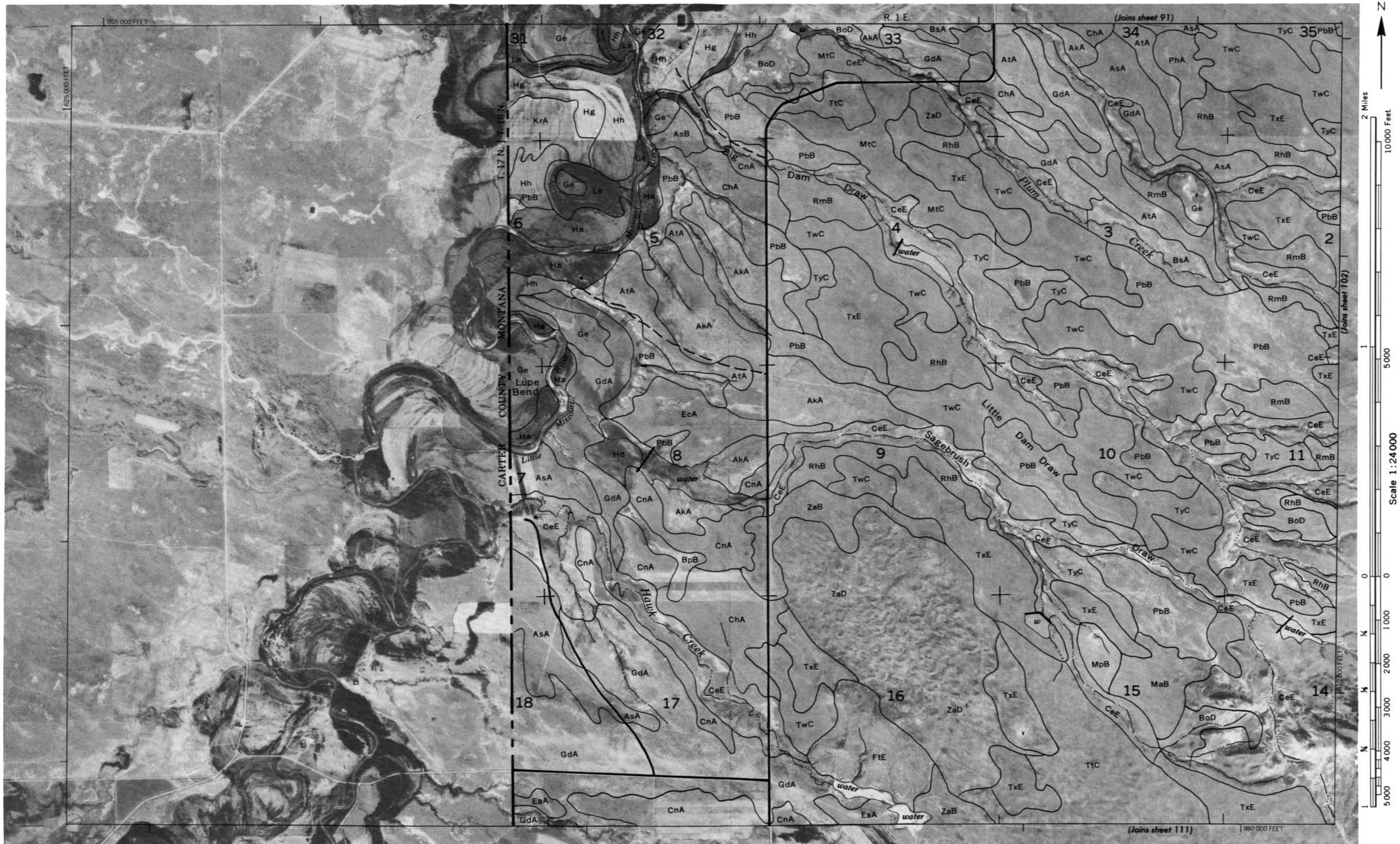


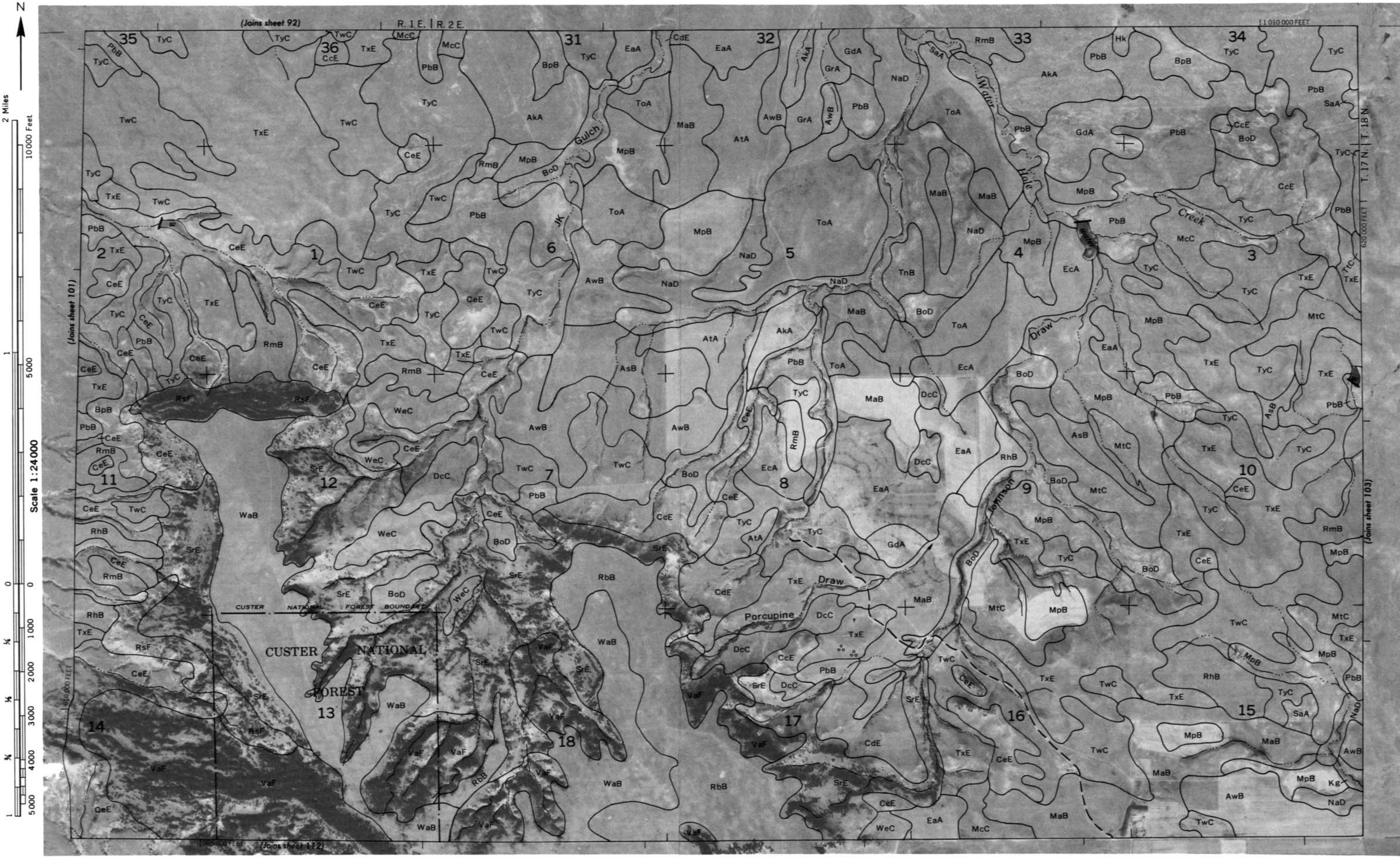
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

101

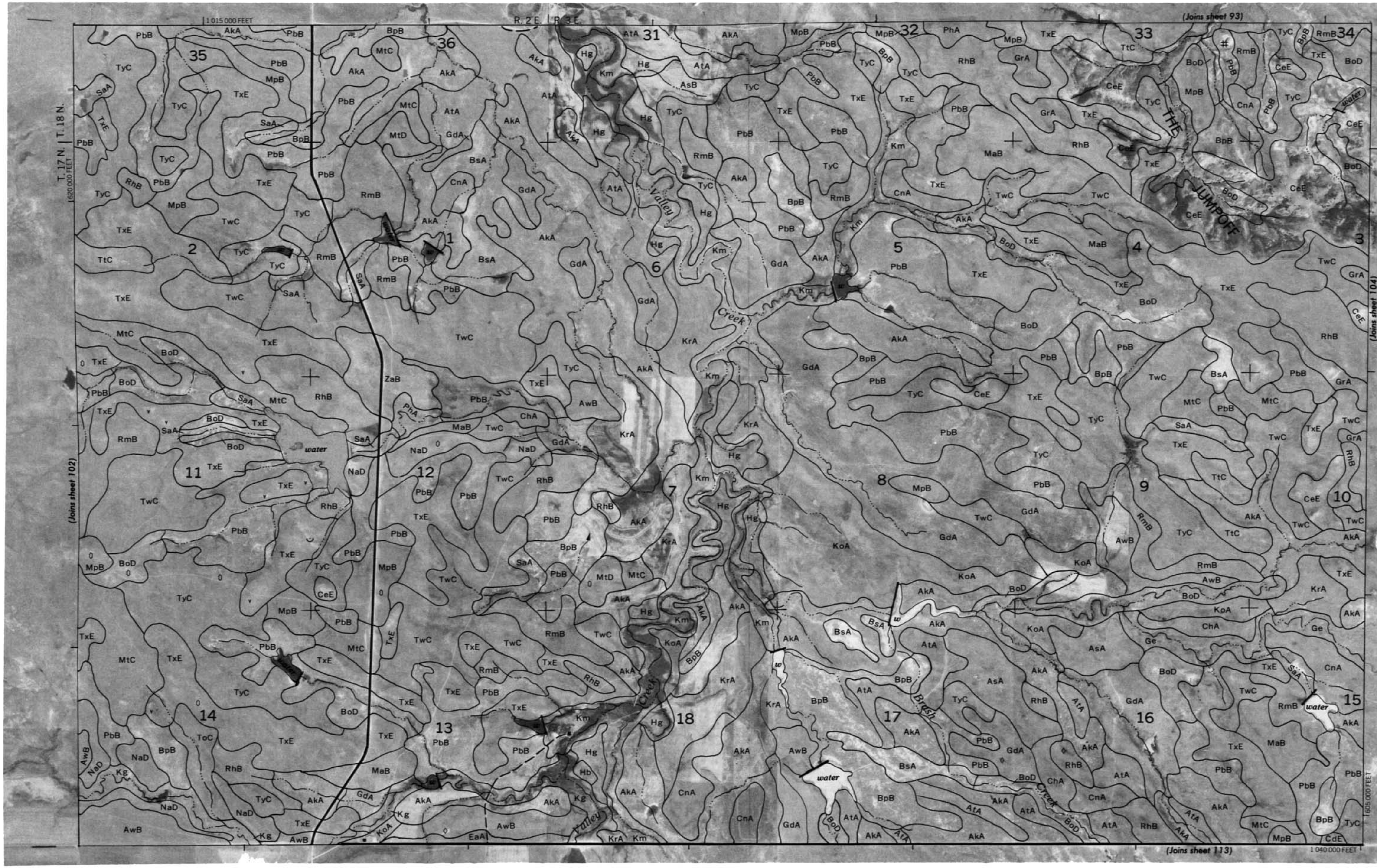
HARDING COUNTY, SOUTH DAKOTA NO. 101

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



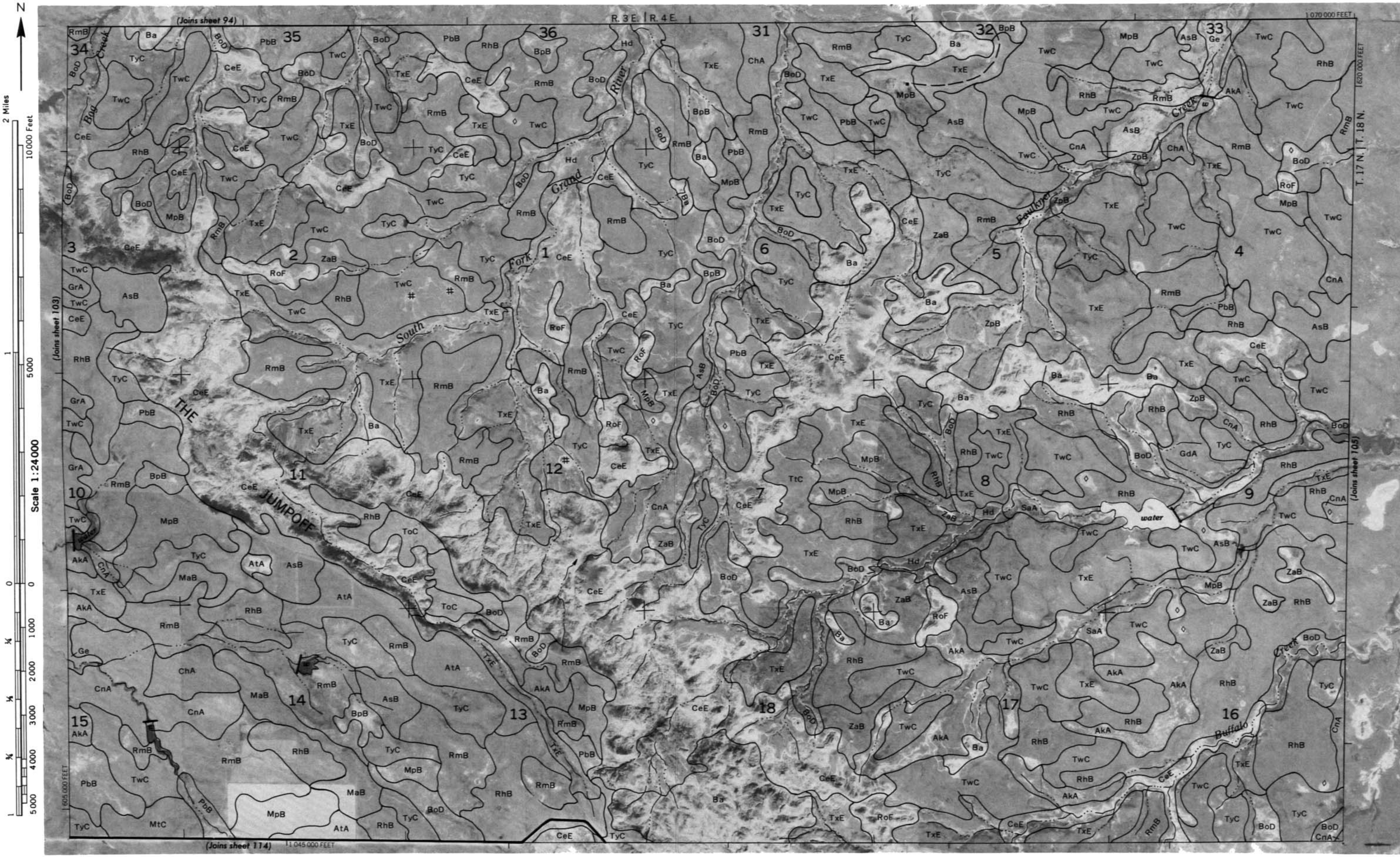


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

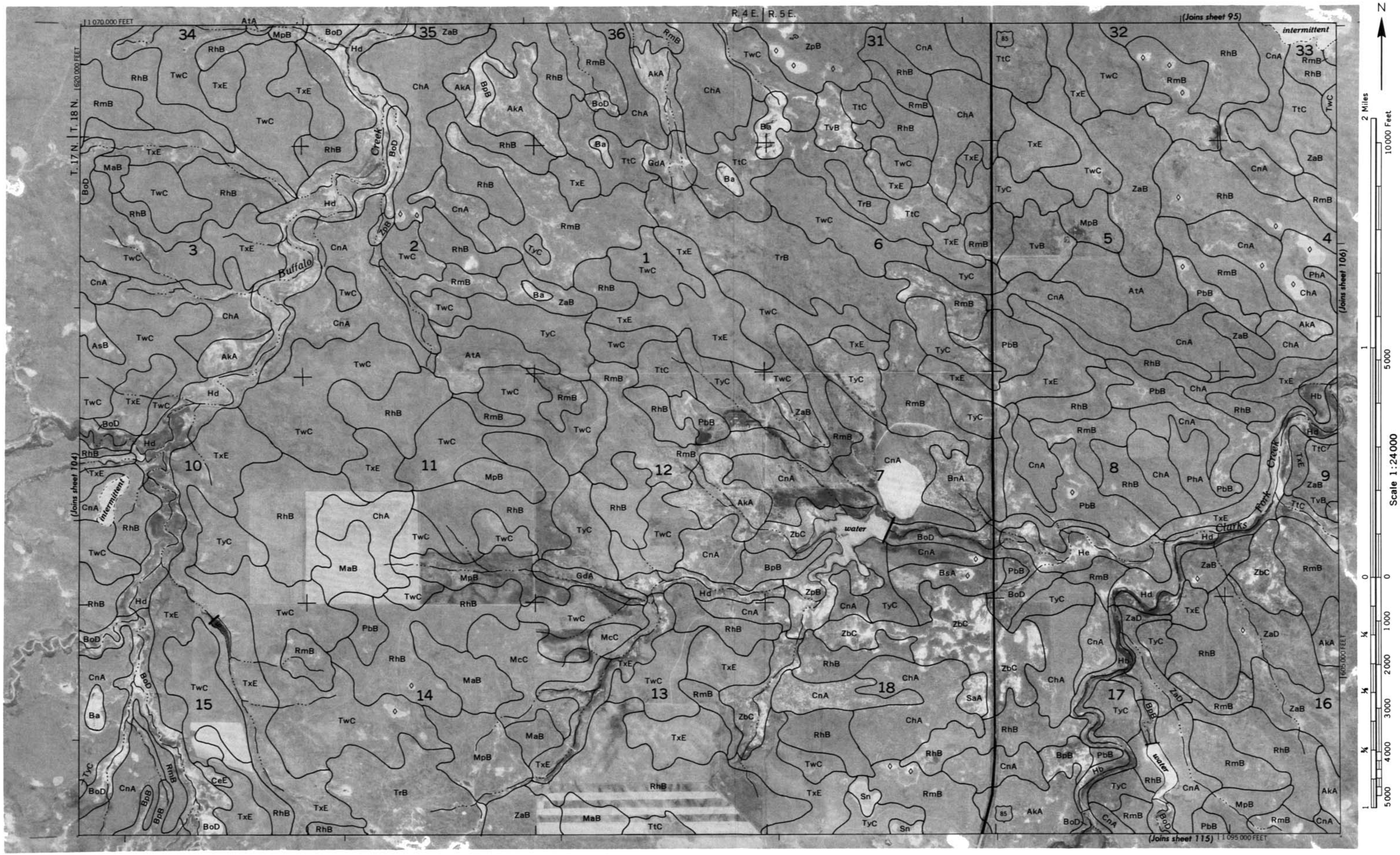


HARDING COUNTY, SOUTH DAKOTA NO. 103

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

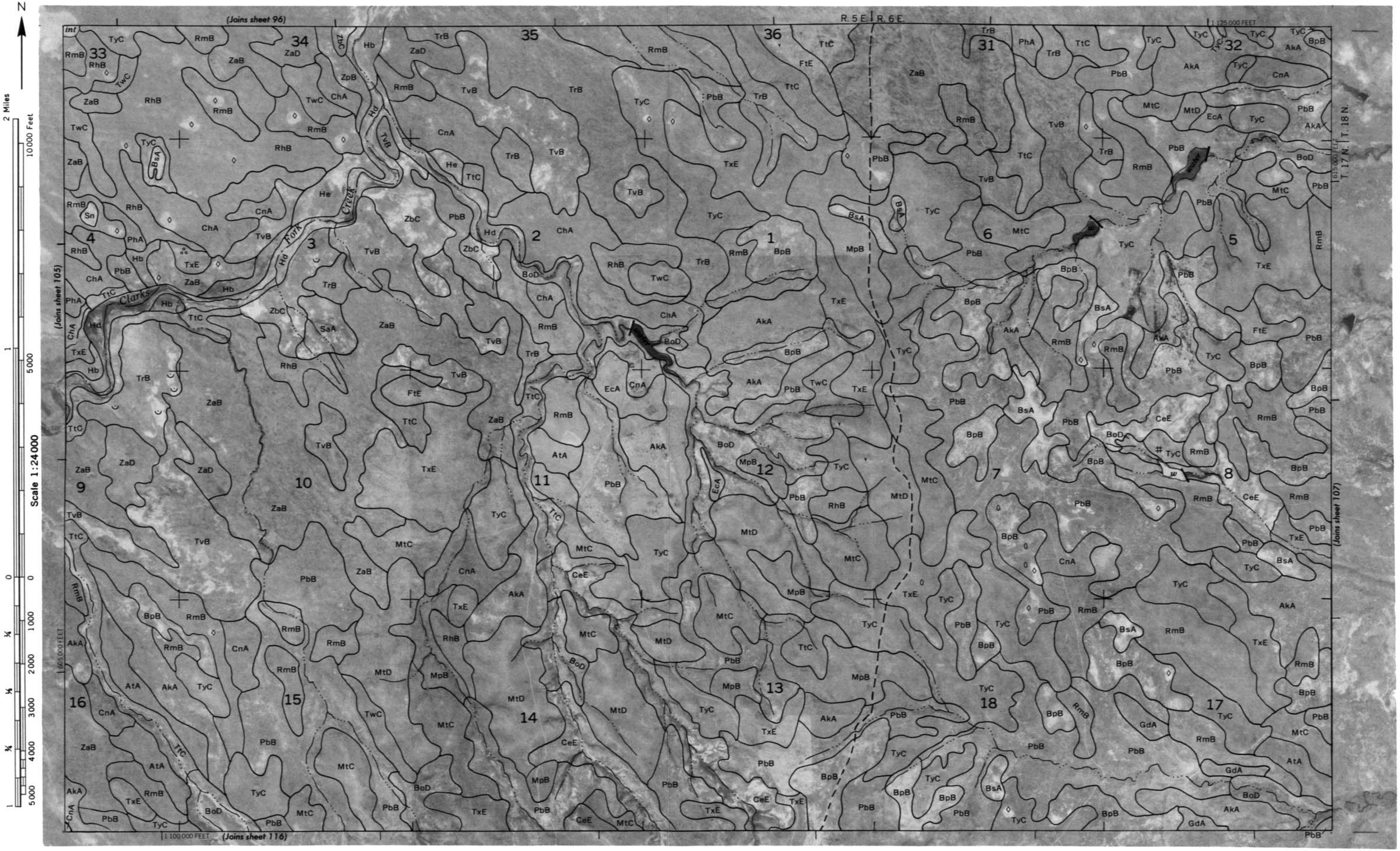


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



HARDING COUNTY, SOUTH DAKOTA NO. 105

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

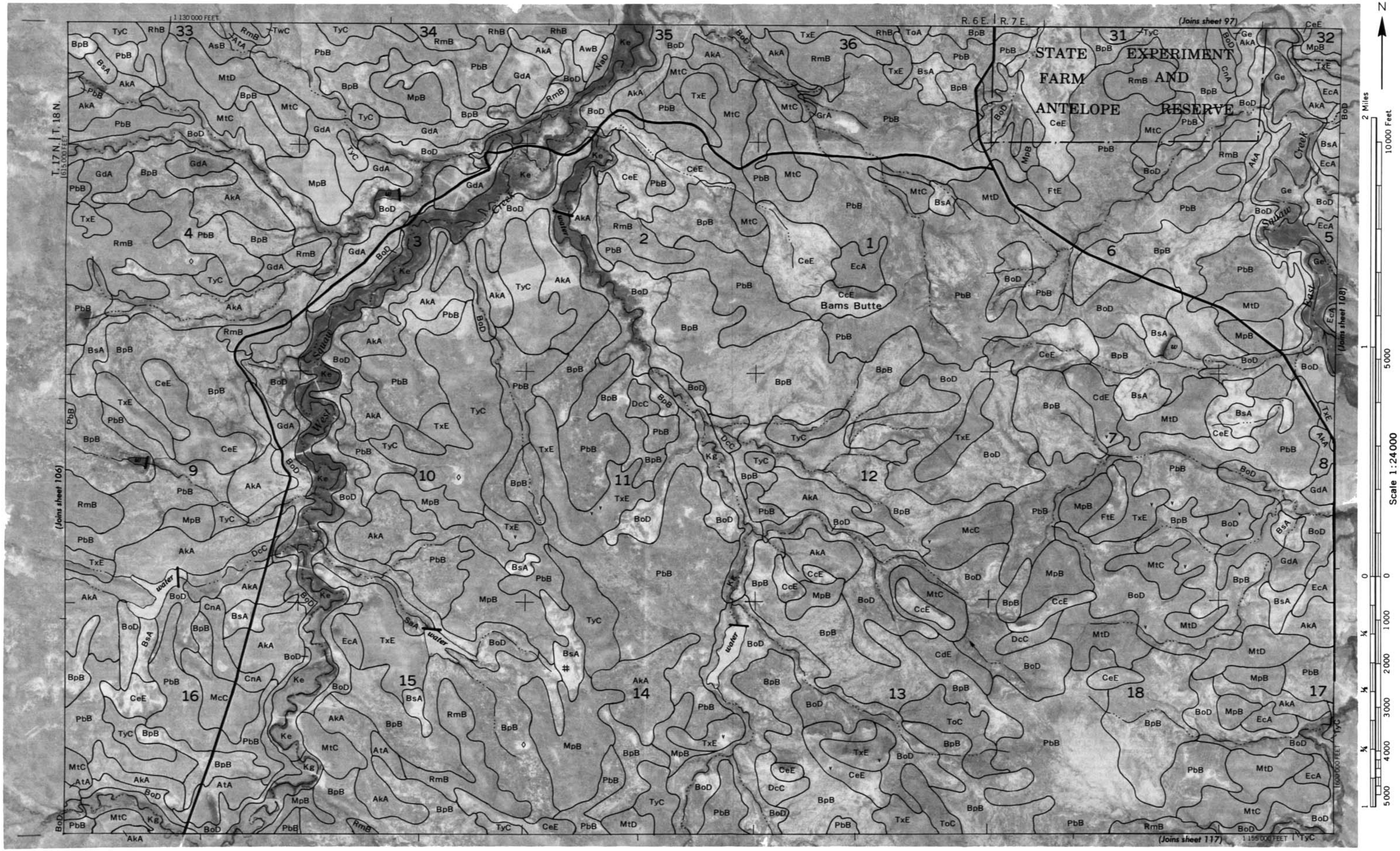


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

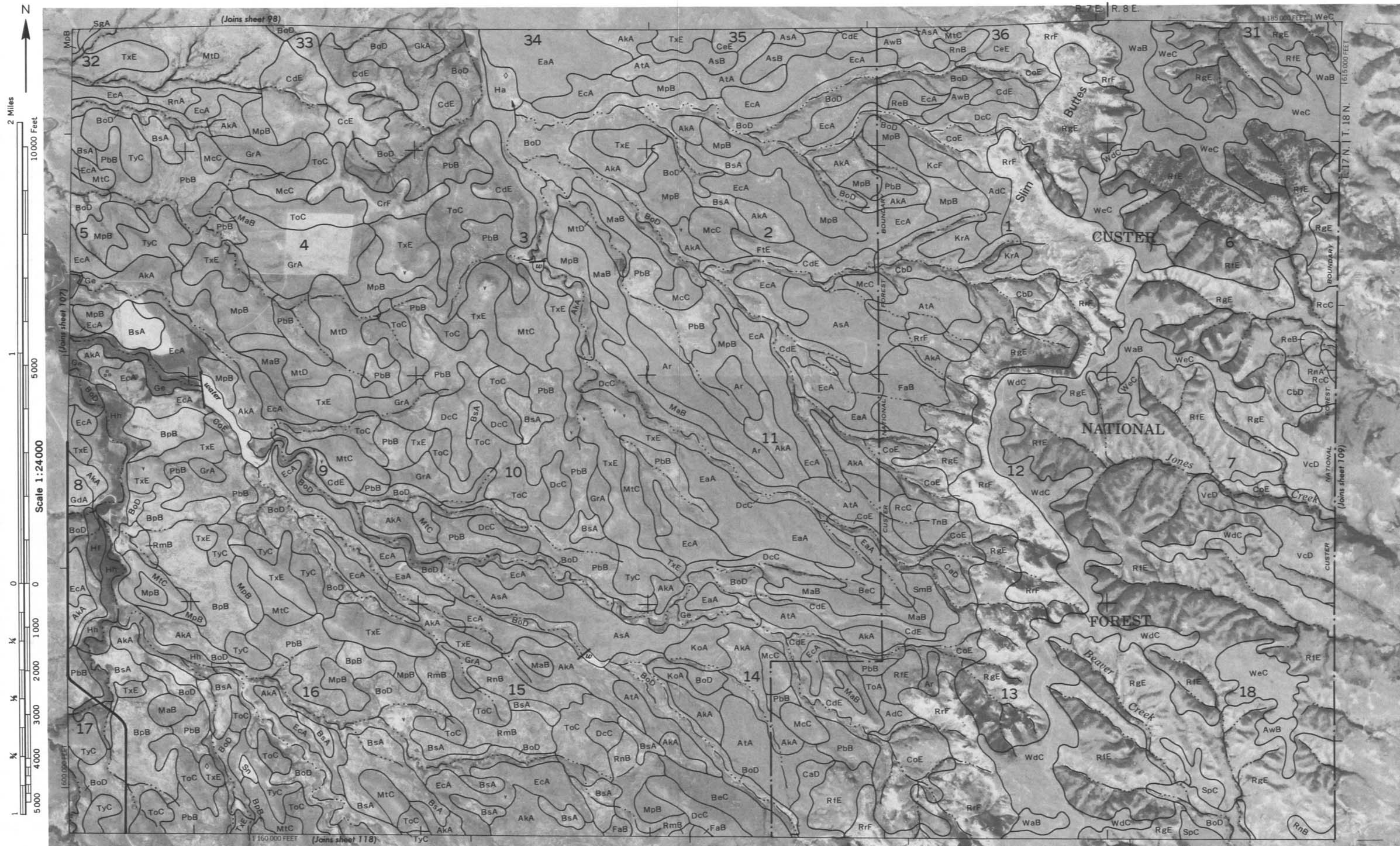
107

HARDING COUNTY, SOUTH DAKOTA NO. 107

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



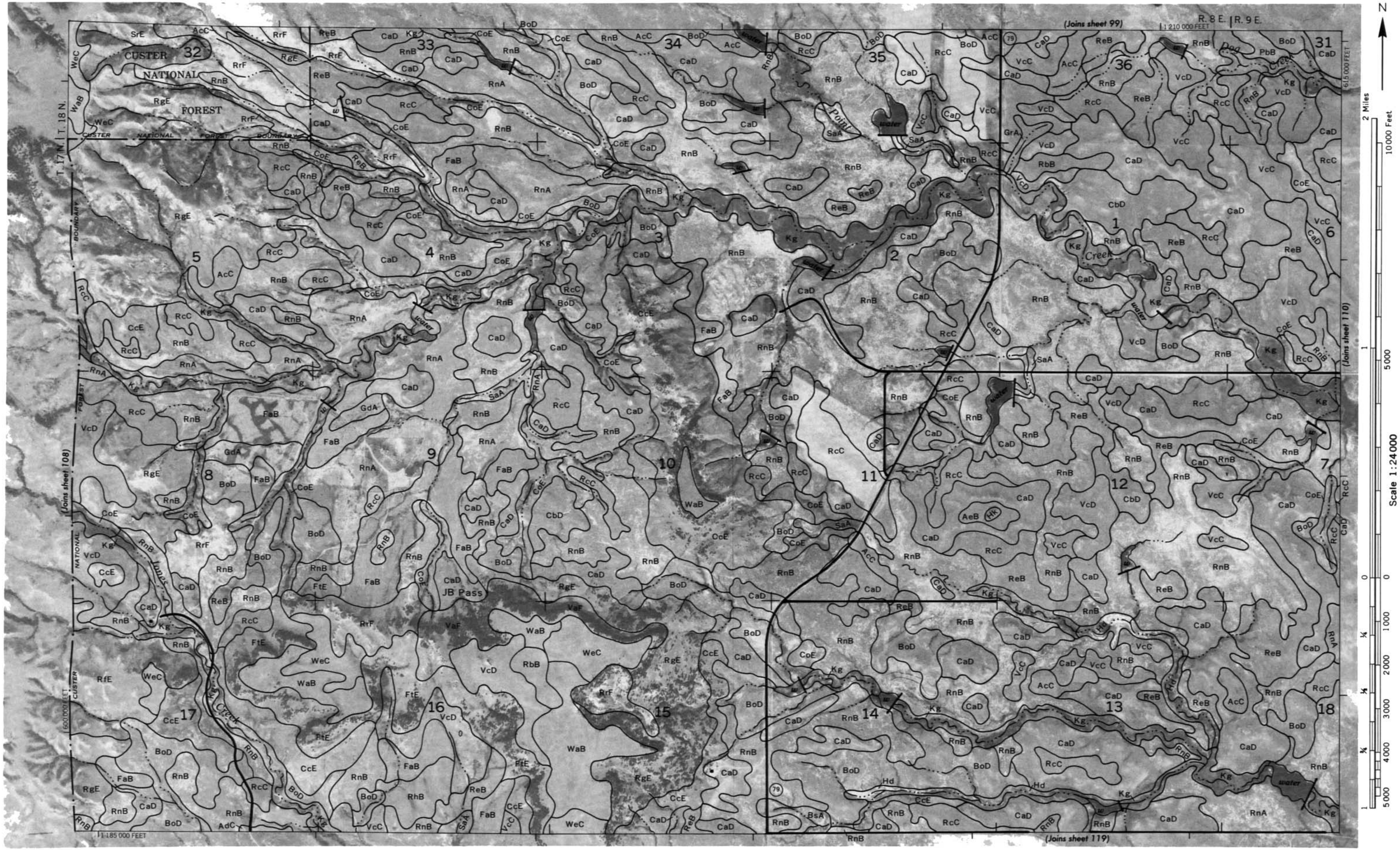
(108)

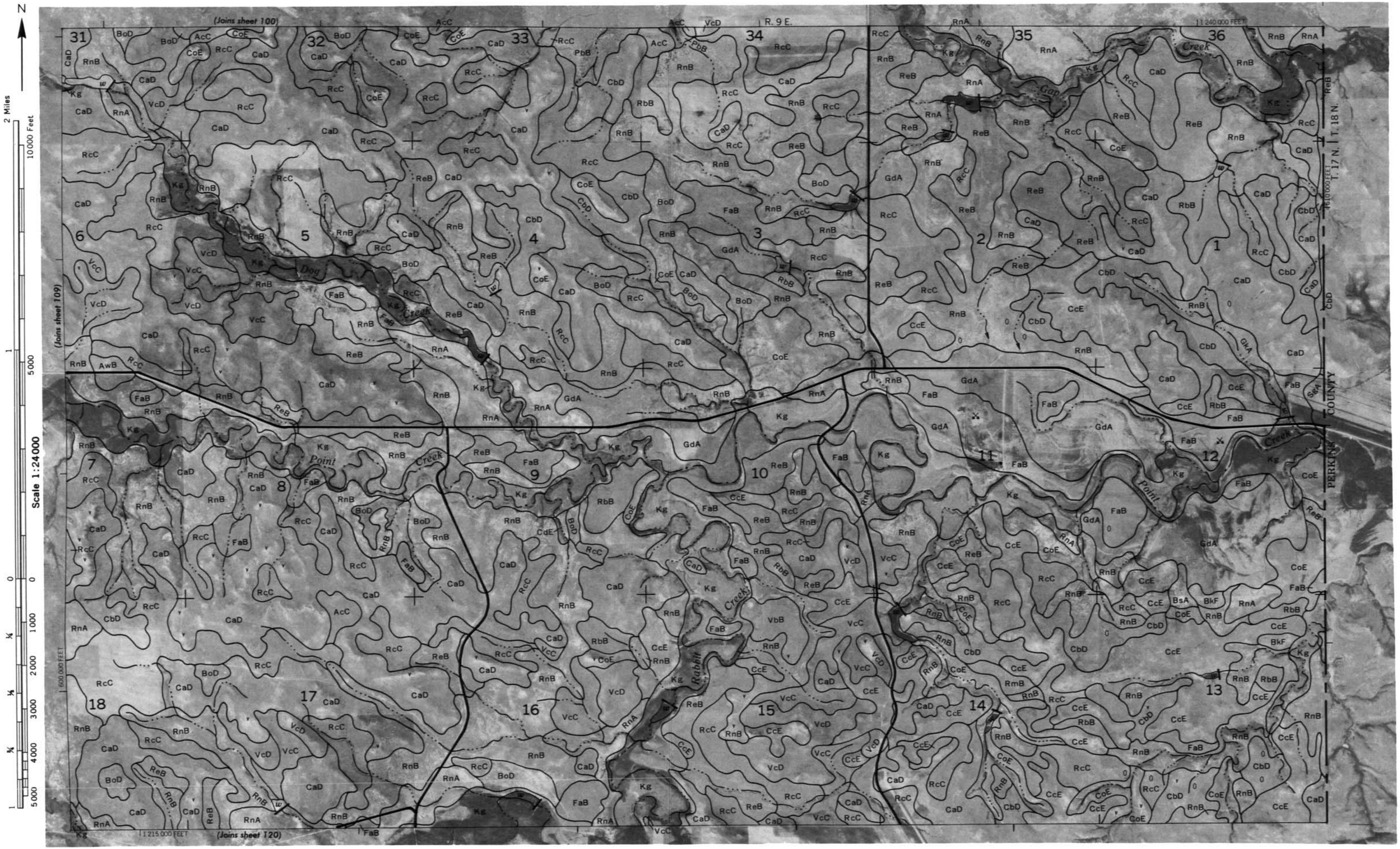


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 109

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



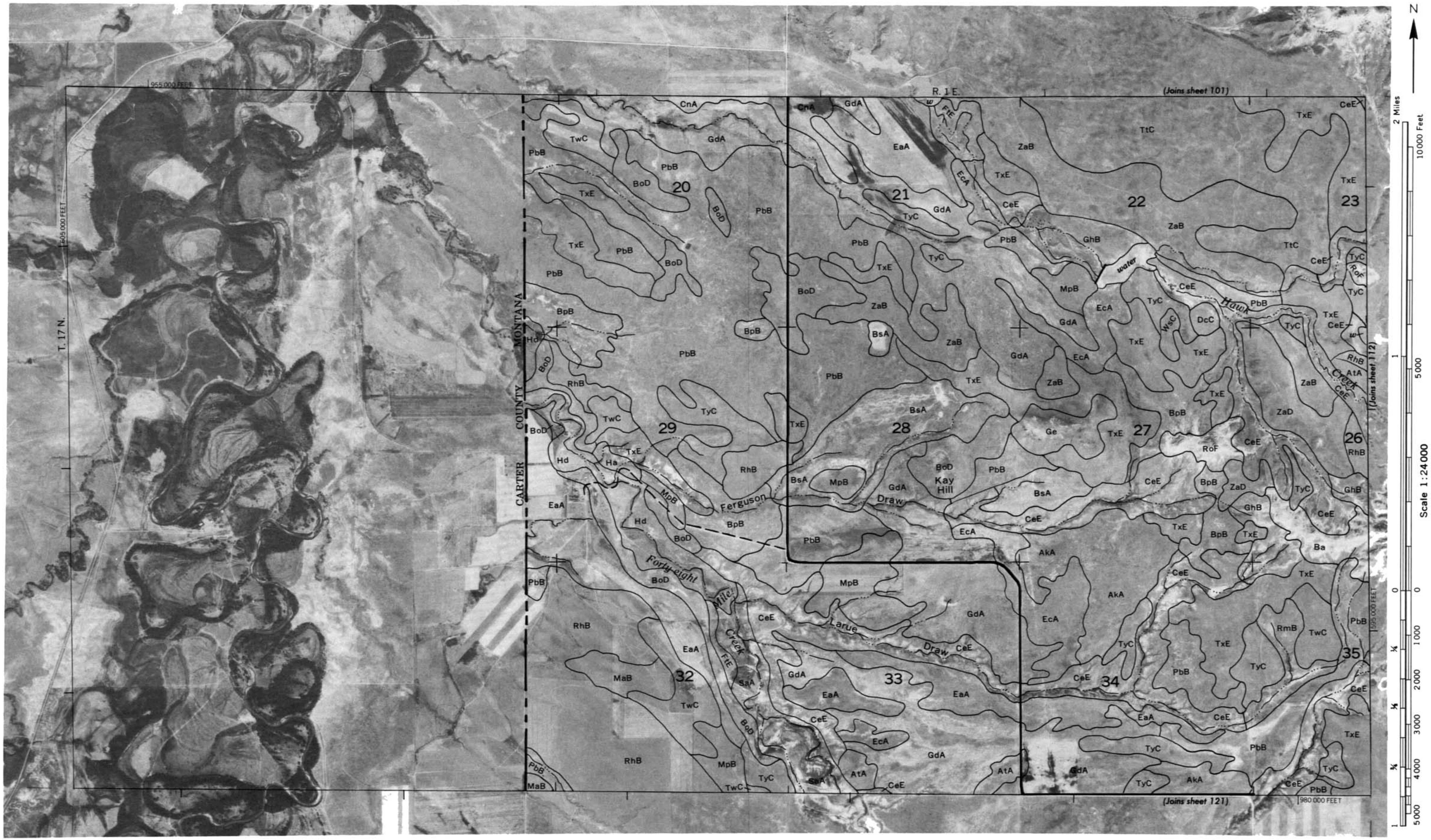


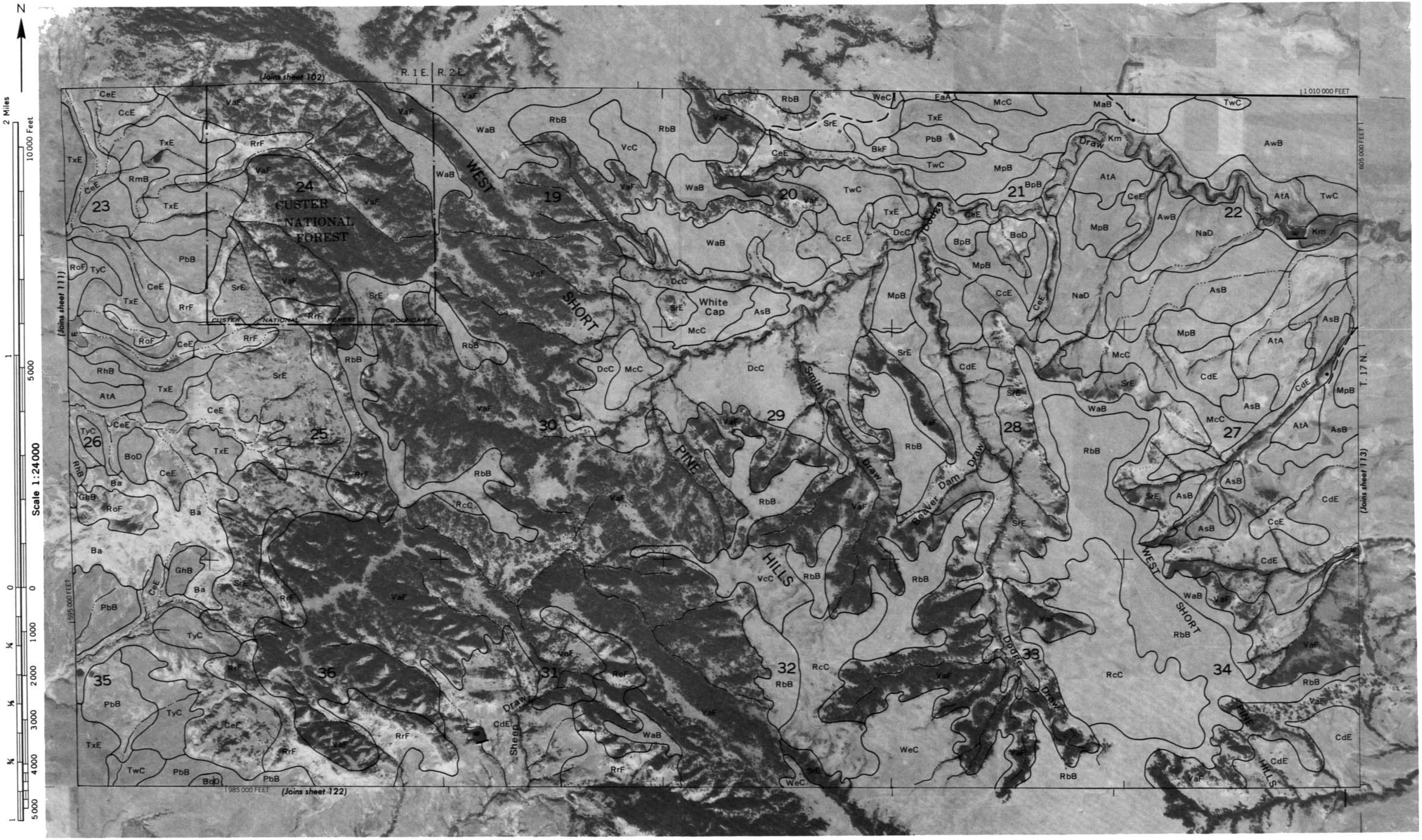
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 110

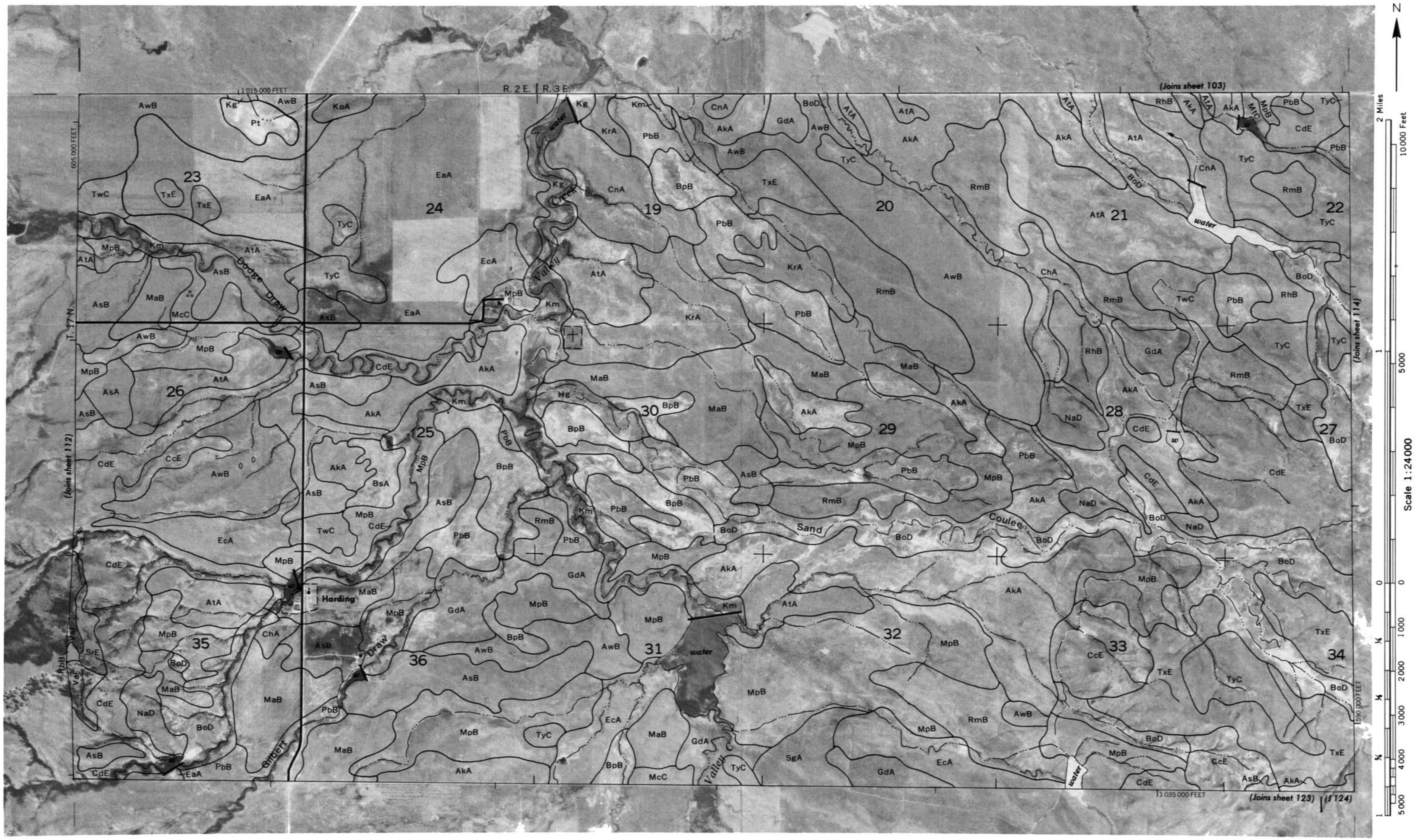
HARDING COUNTY, SOUTH DAKOTA NO. 111

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



HARDING COUNTY, SOUTH DAKOTA NO. 113

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(114)

N

2 Miles

10 000 Feet

1

5000

Scale 1:24 000

0

0

1000

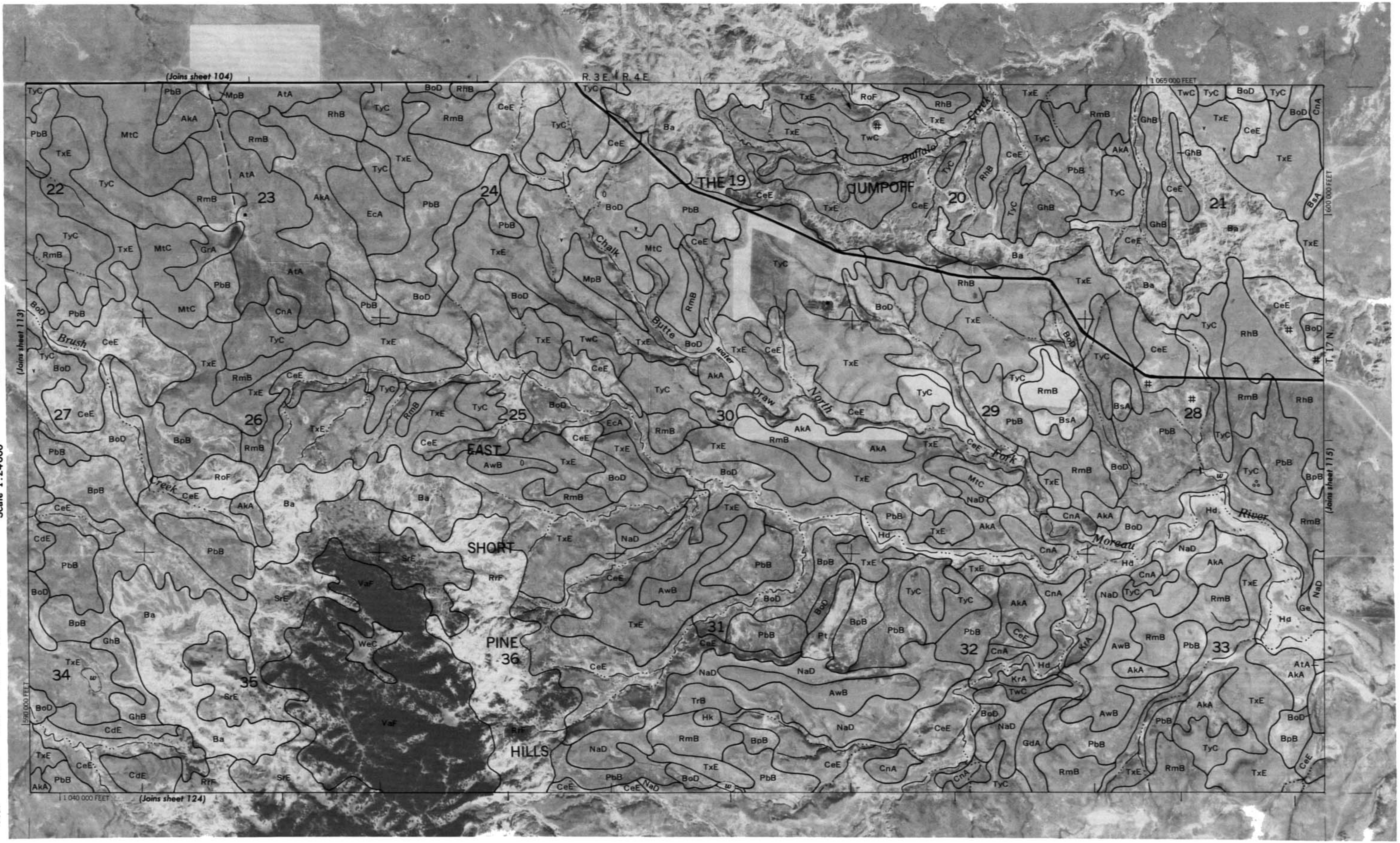
2000

3000

4000

5000

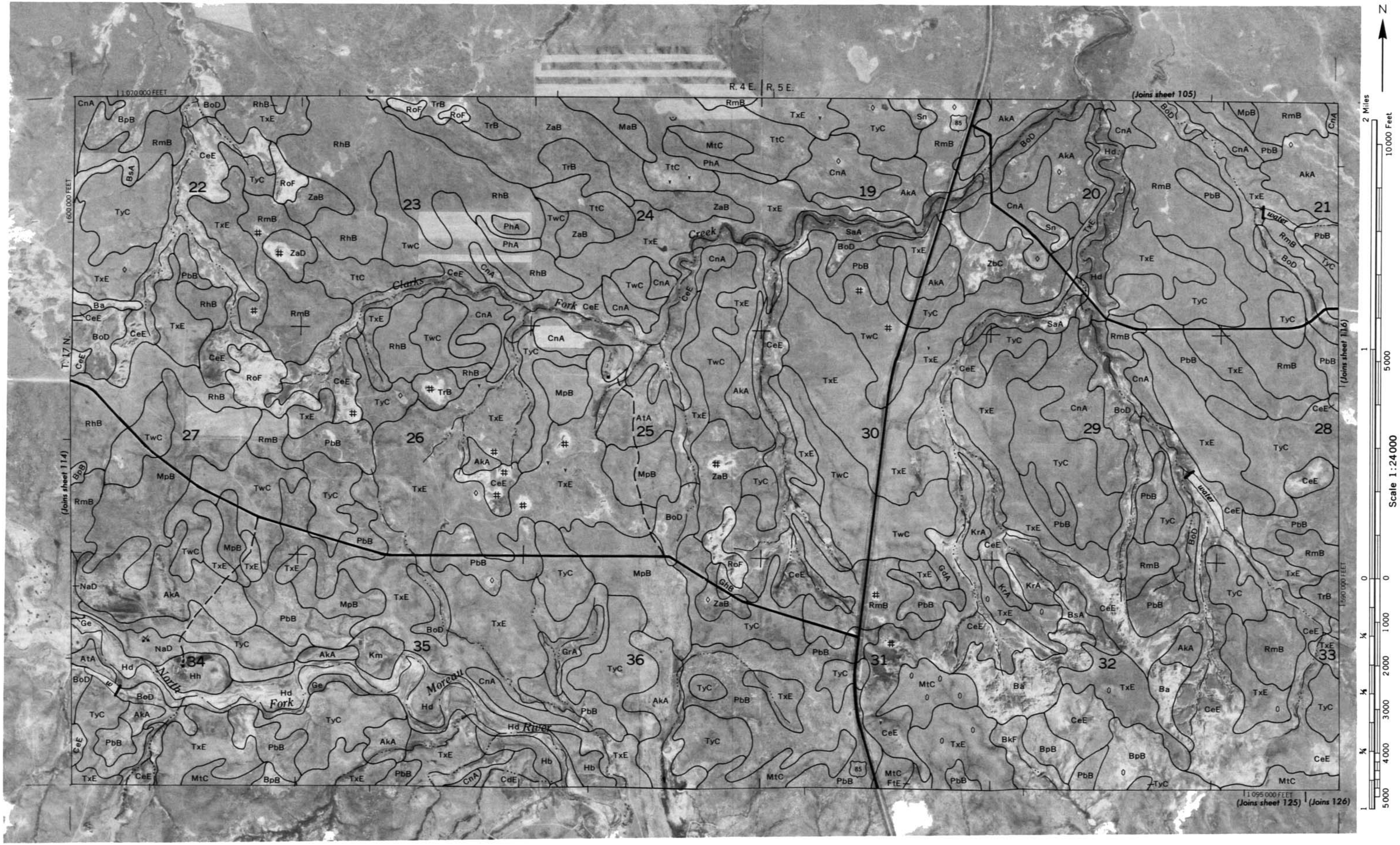
1



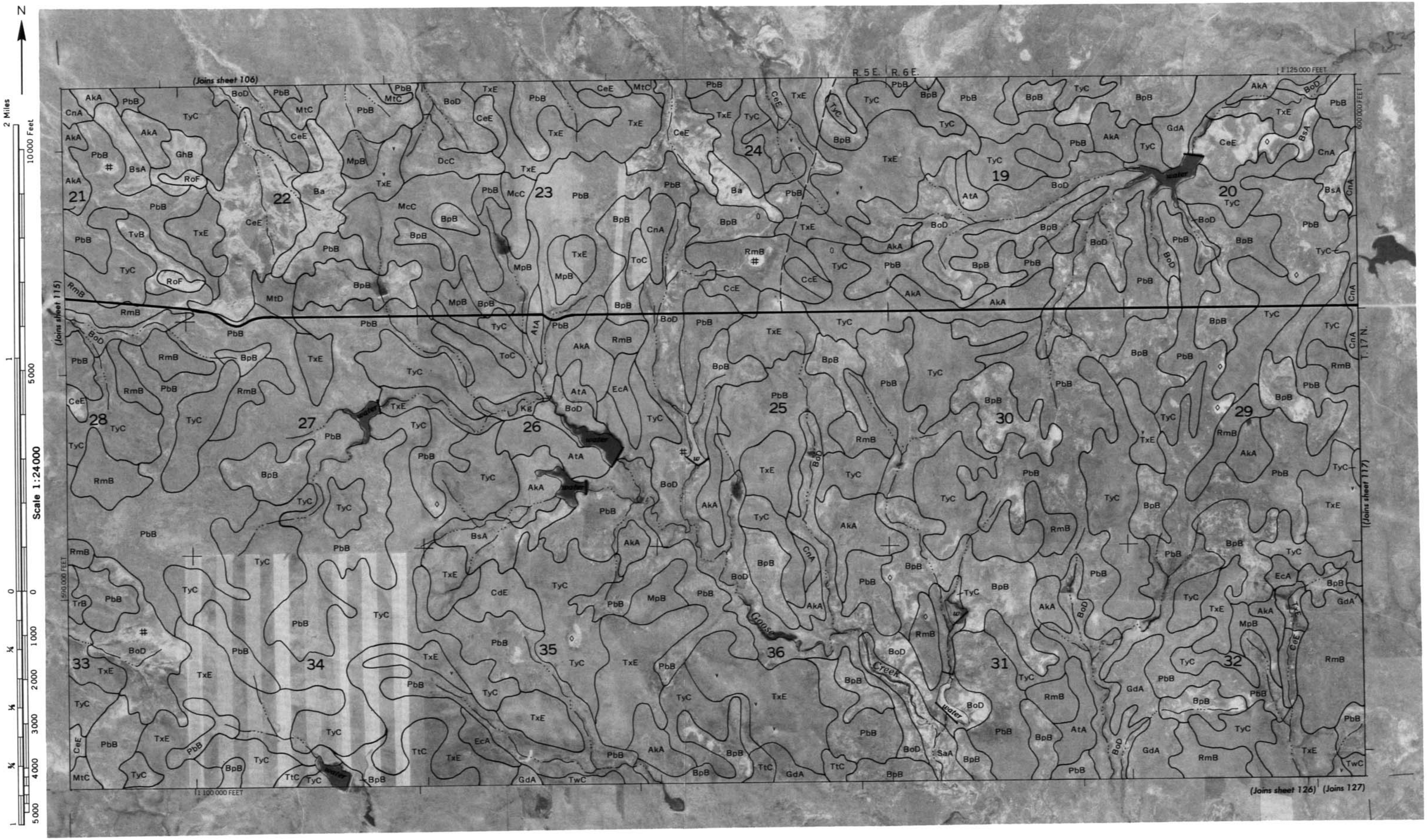
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 115

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



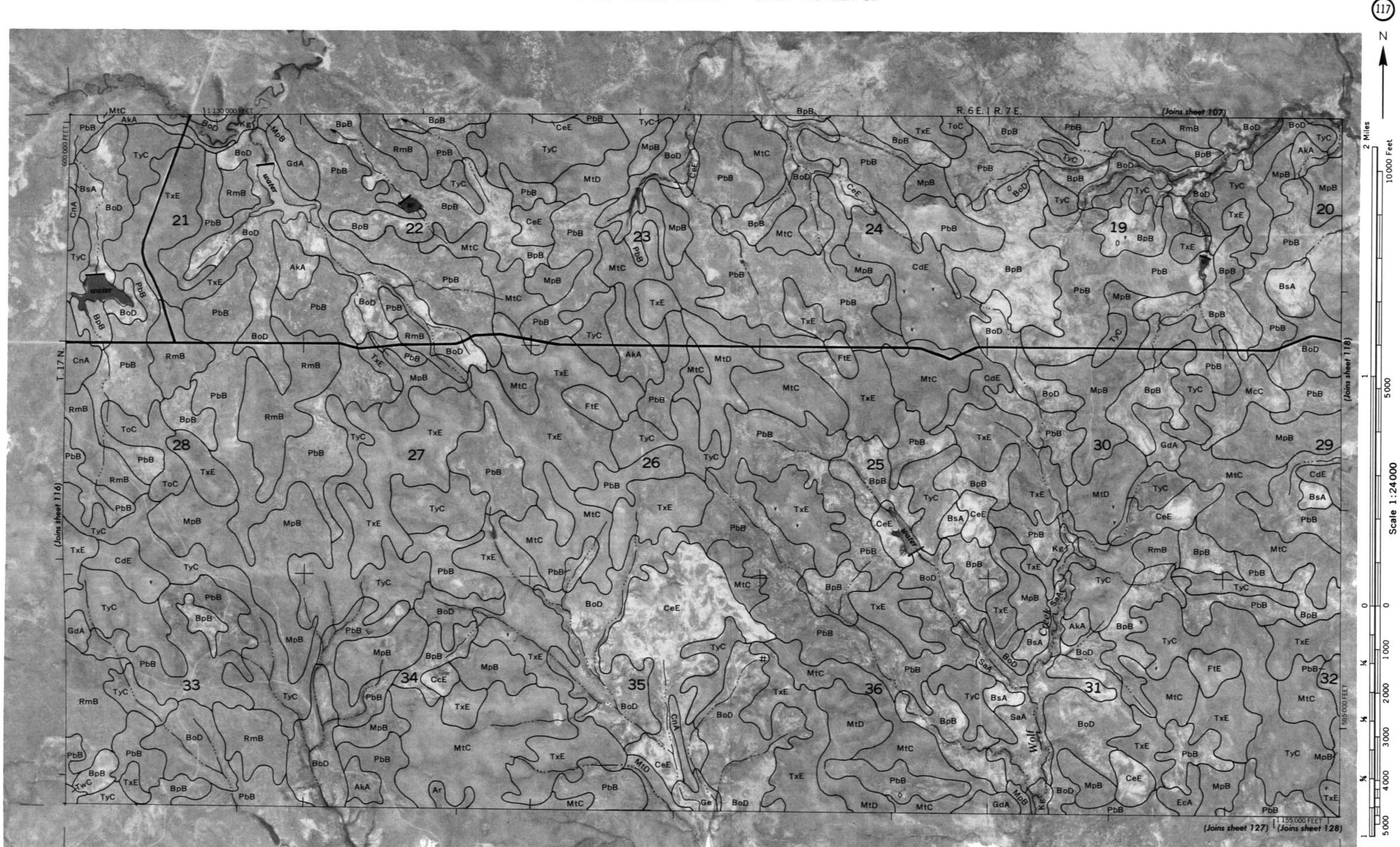
116

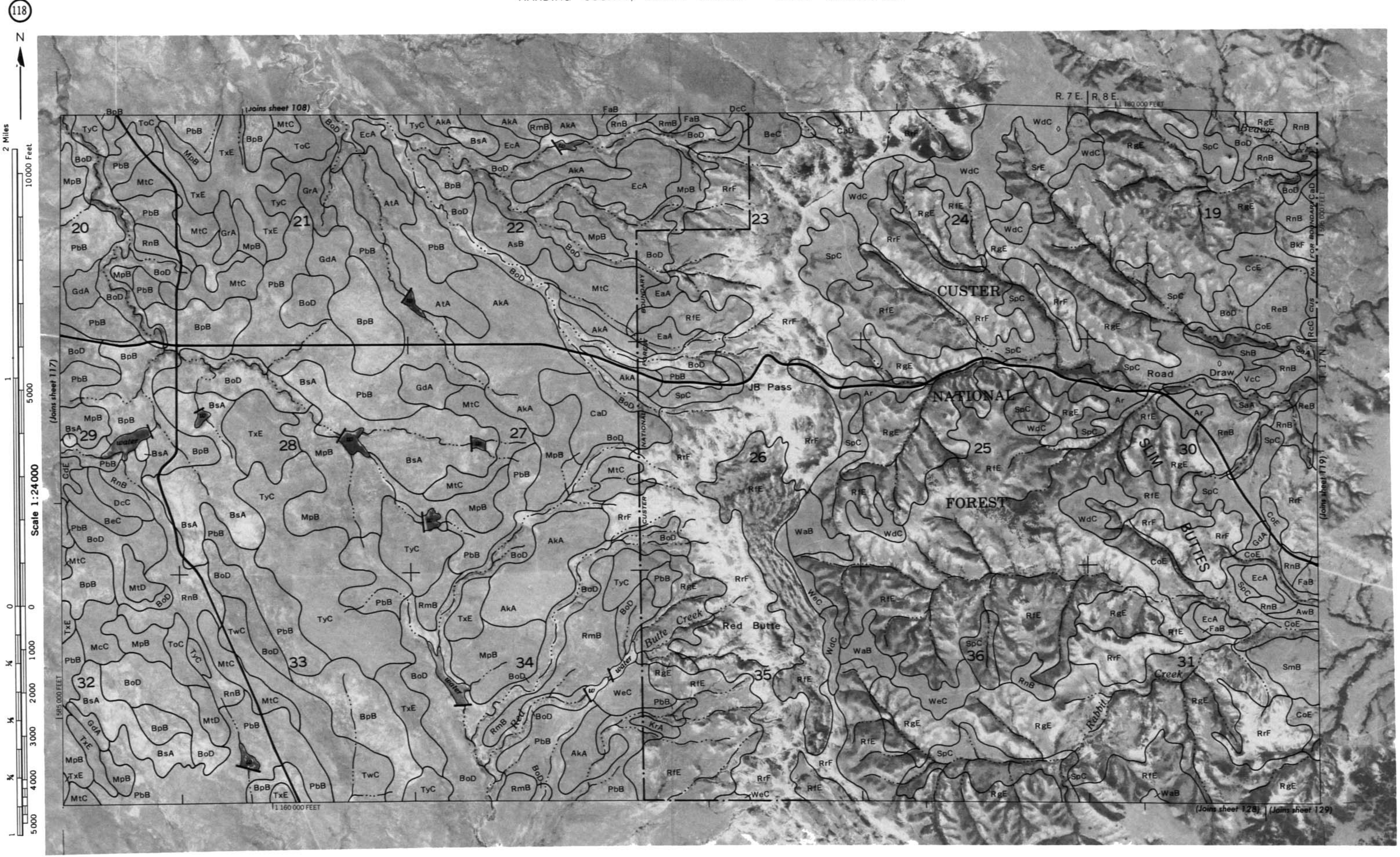


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 117

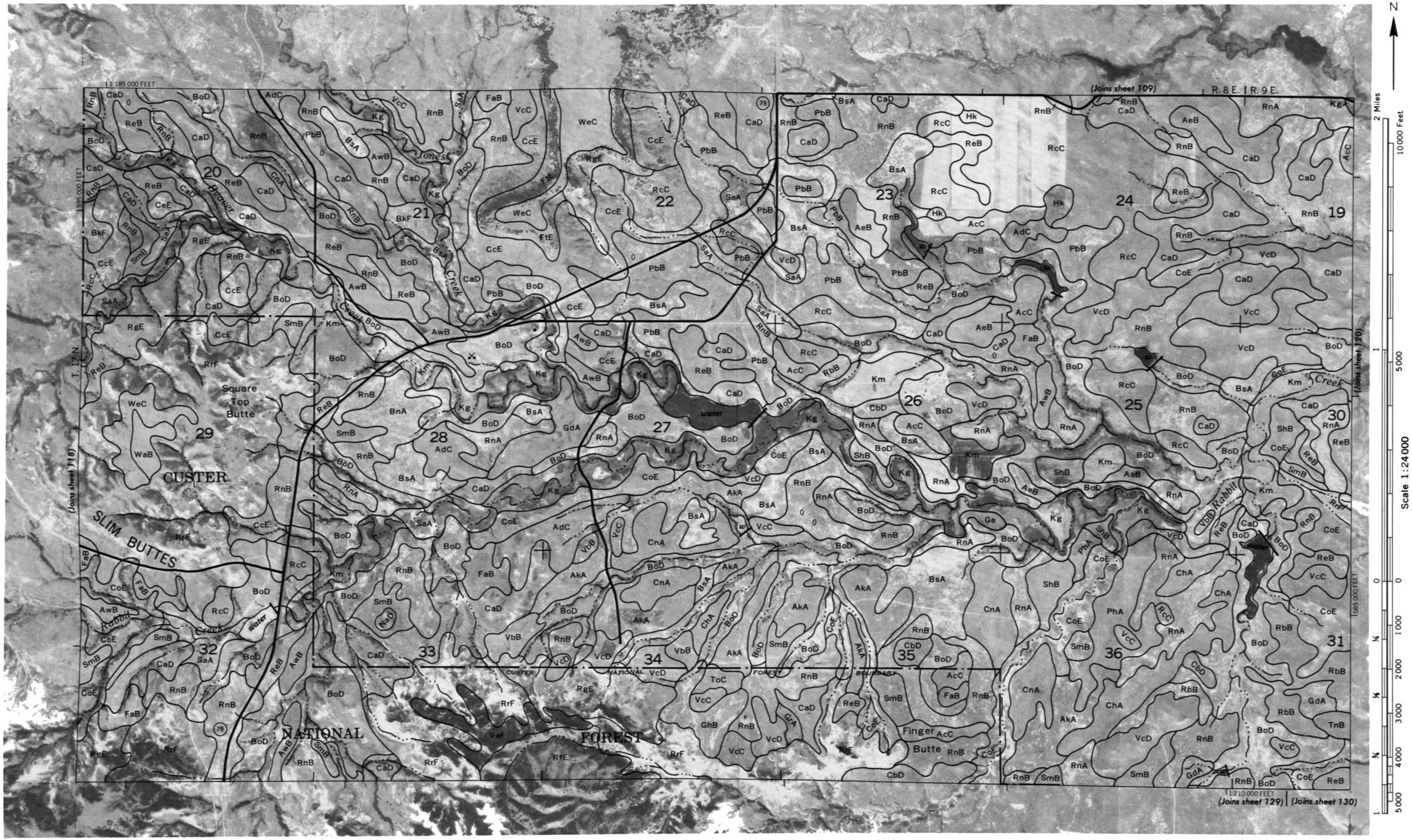
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



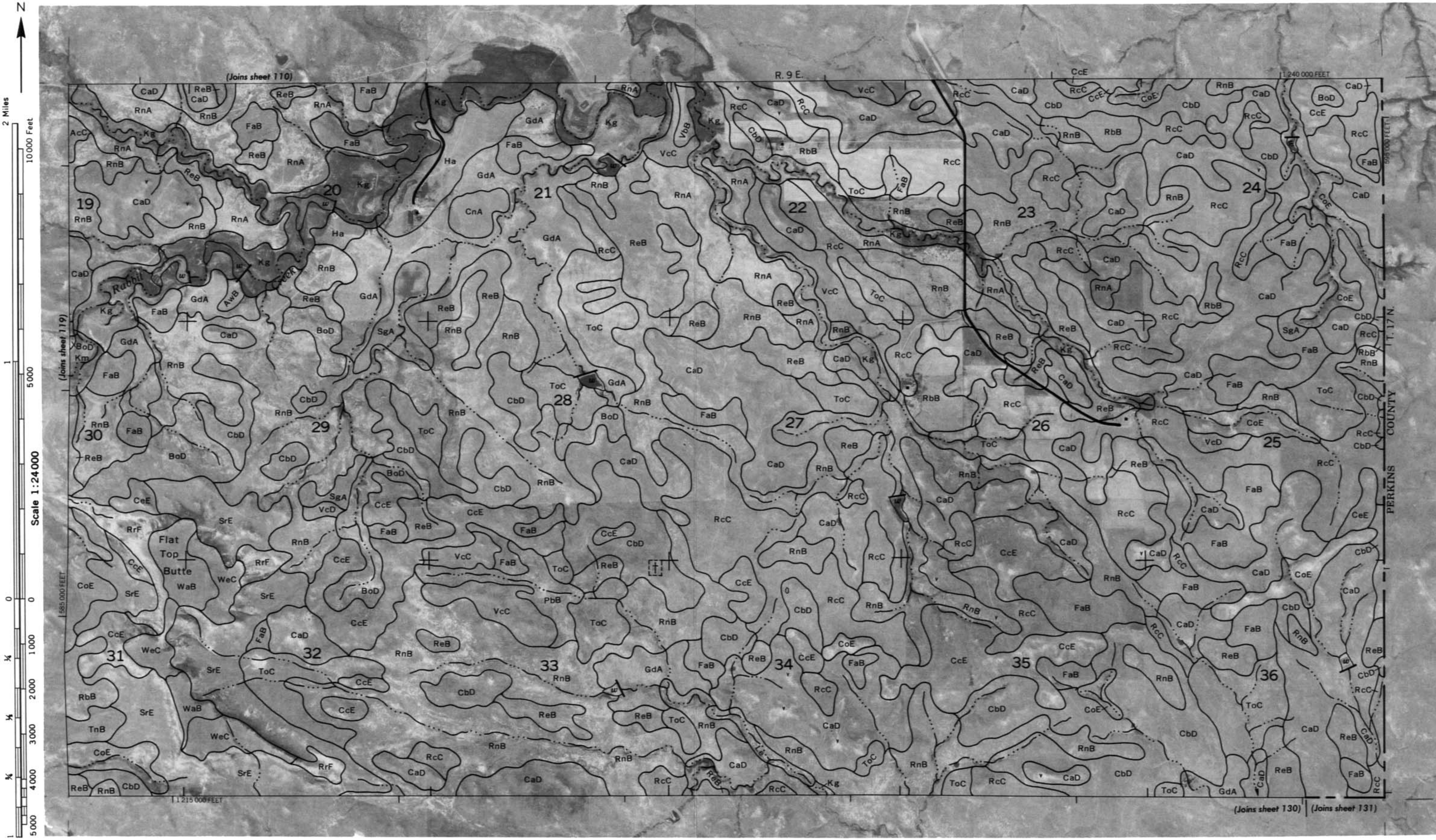


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

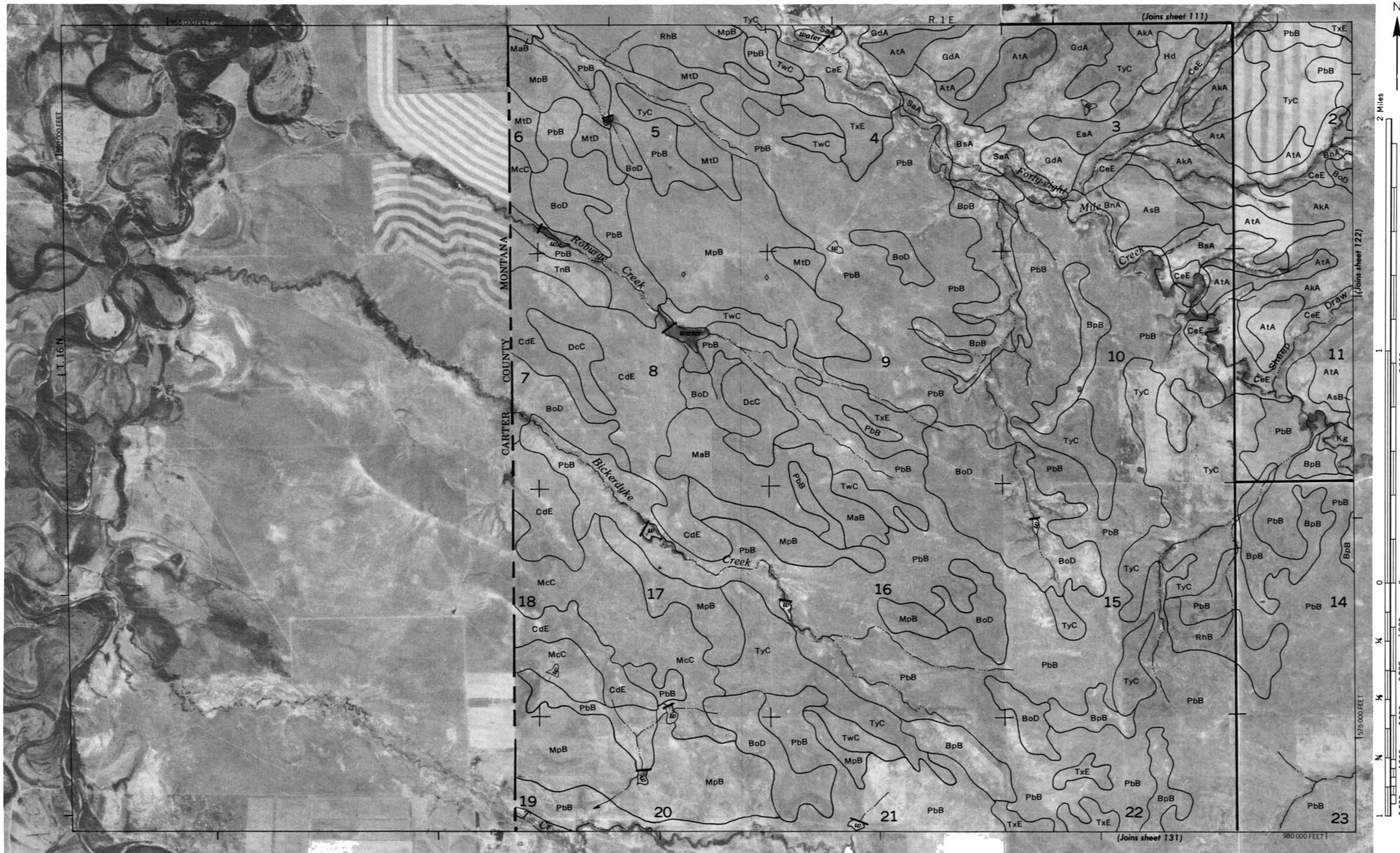
HARDING COUNTY, SOUTH DAKOTA NO. 118



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

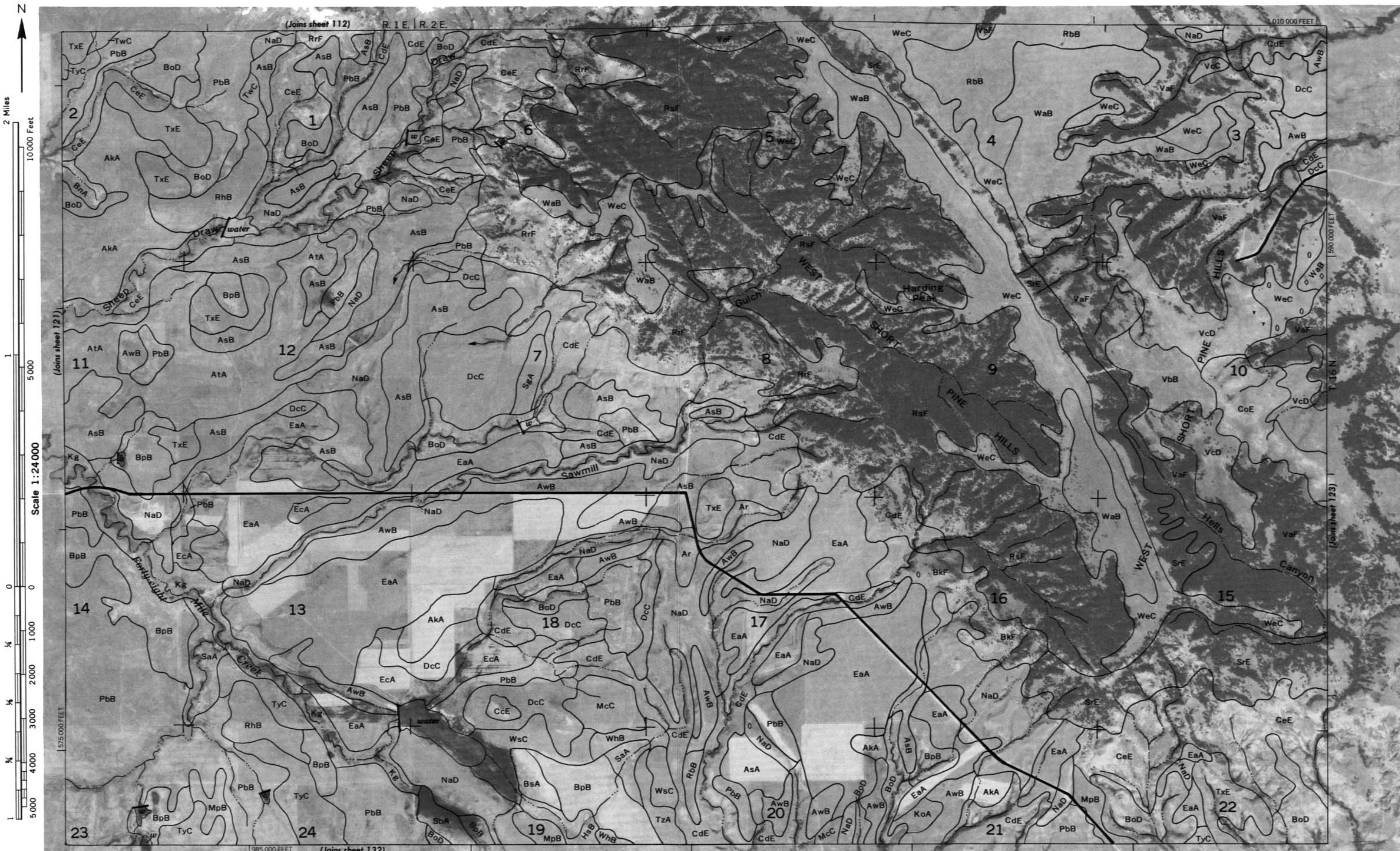


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

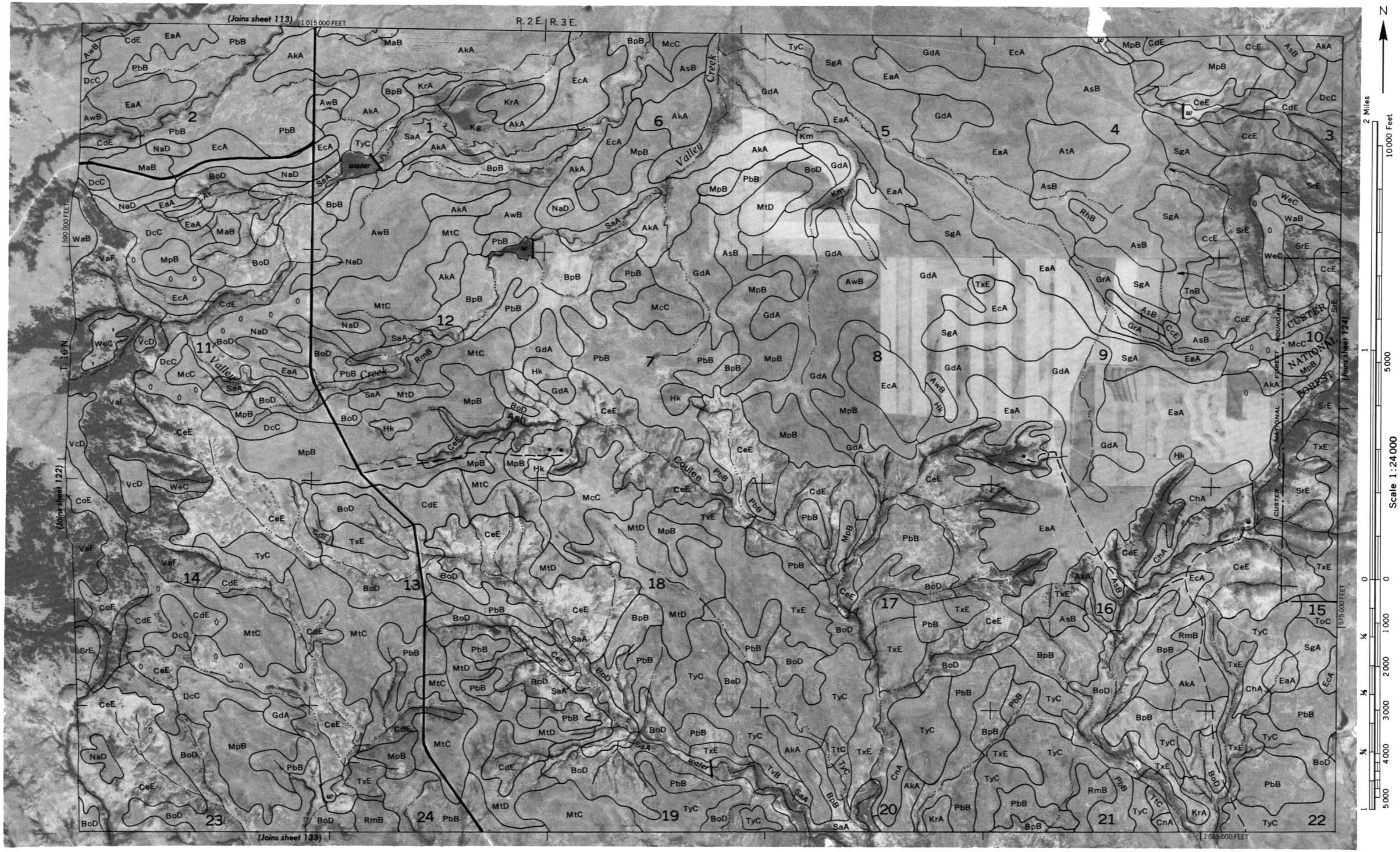


HARDING COUNTY, SOUTH DAKOTA NO. 121

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



HARDING COUNTY, SOUTH DAKOTA NO. 123

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

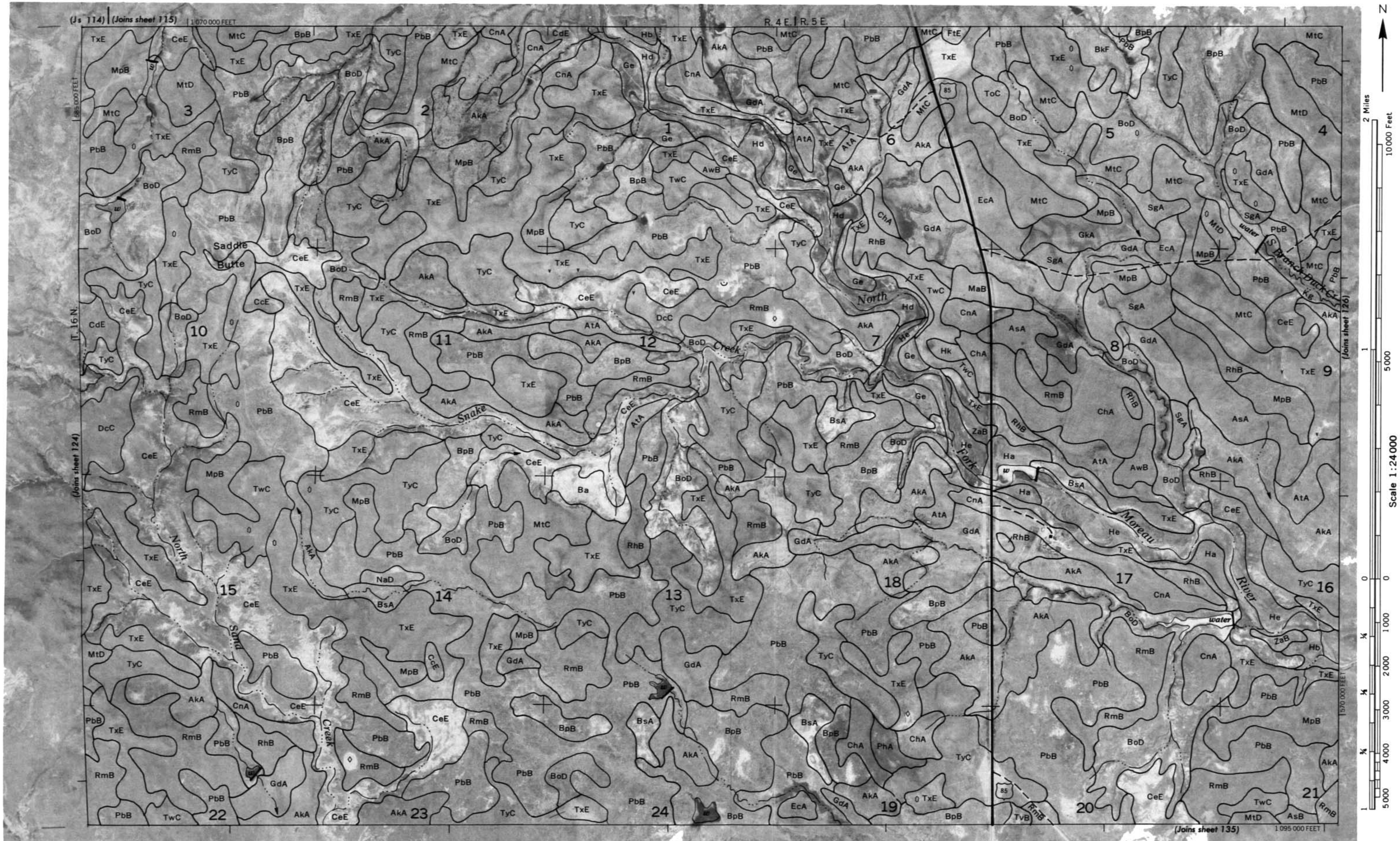
Scale 1:24000

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

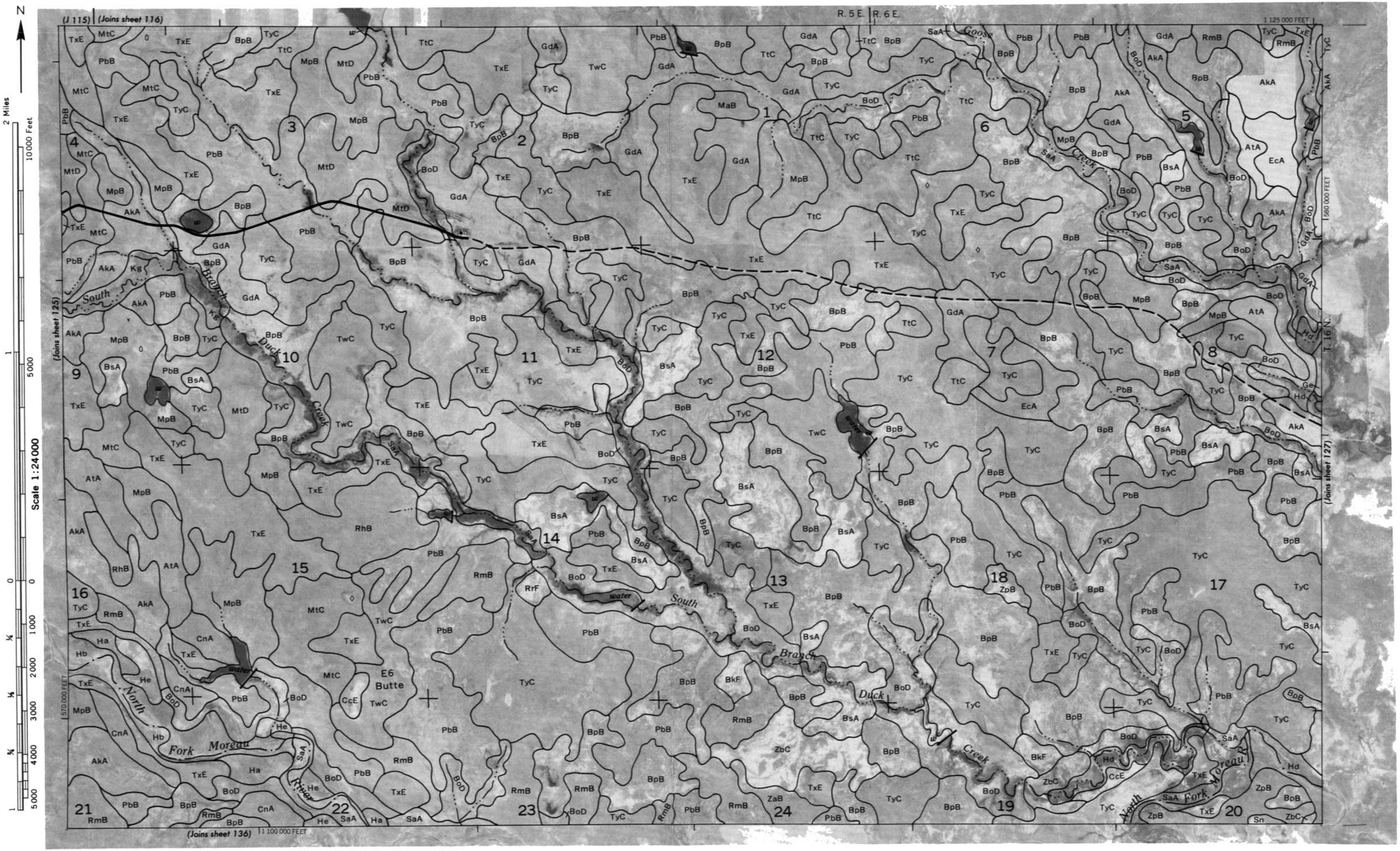
HARDING COUNTY, SOUTH DAKOTA NO. 124

HARDING COUNTY, SOUTH DAKOTA NO. 125

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

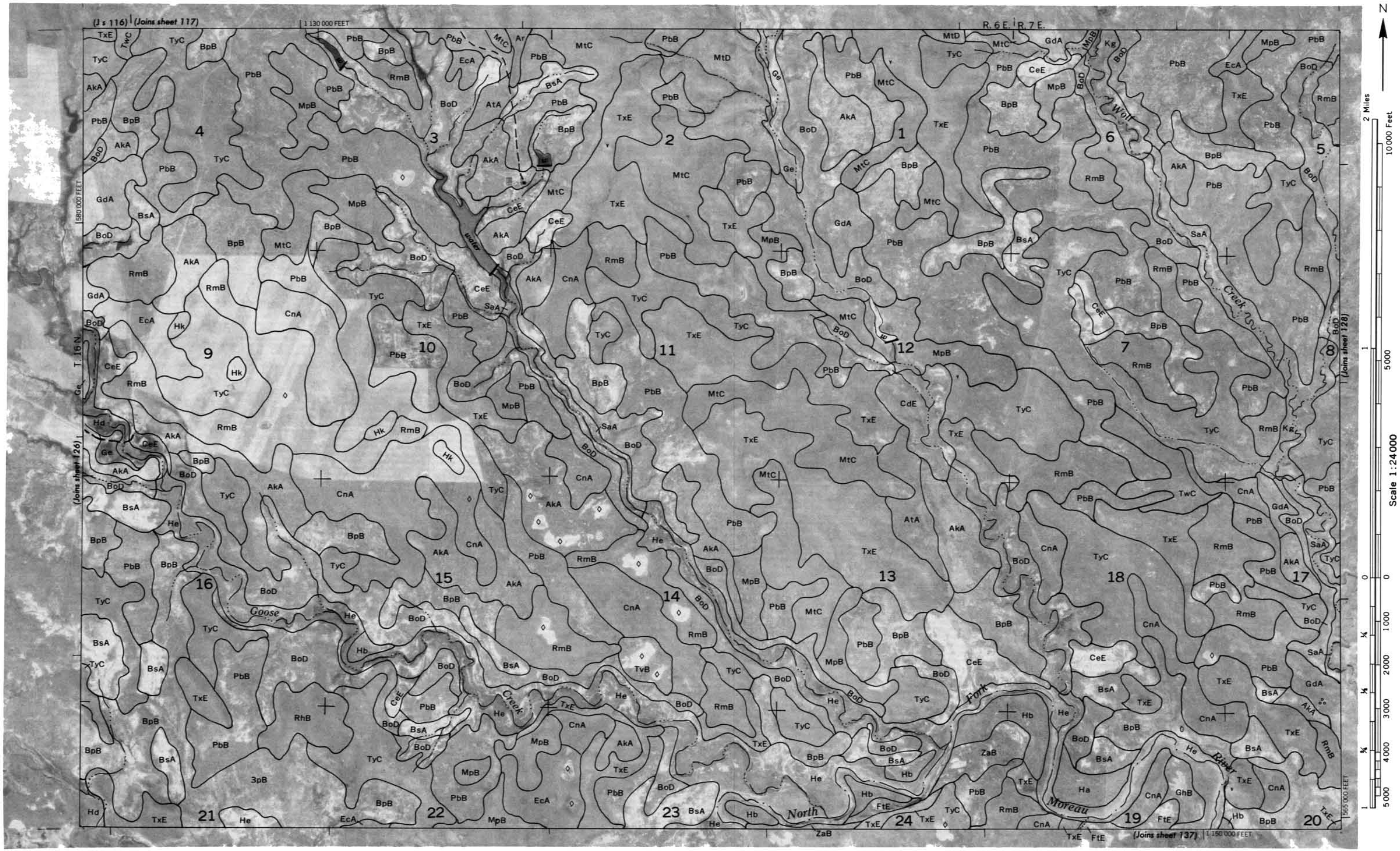


126



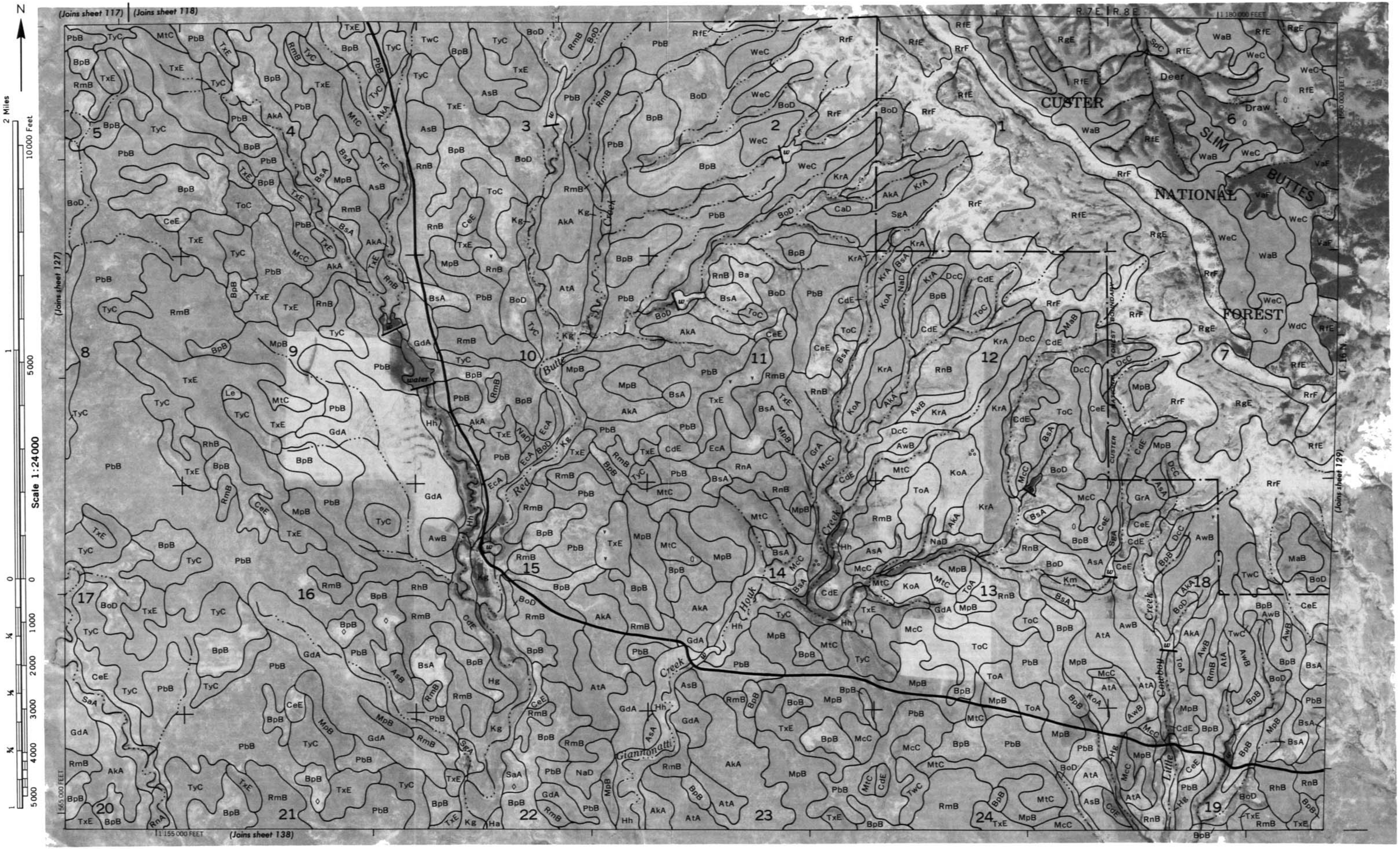
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 126



HARDING COUNTY, SOUTH DAKOTA NO. 127

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

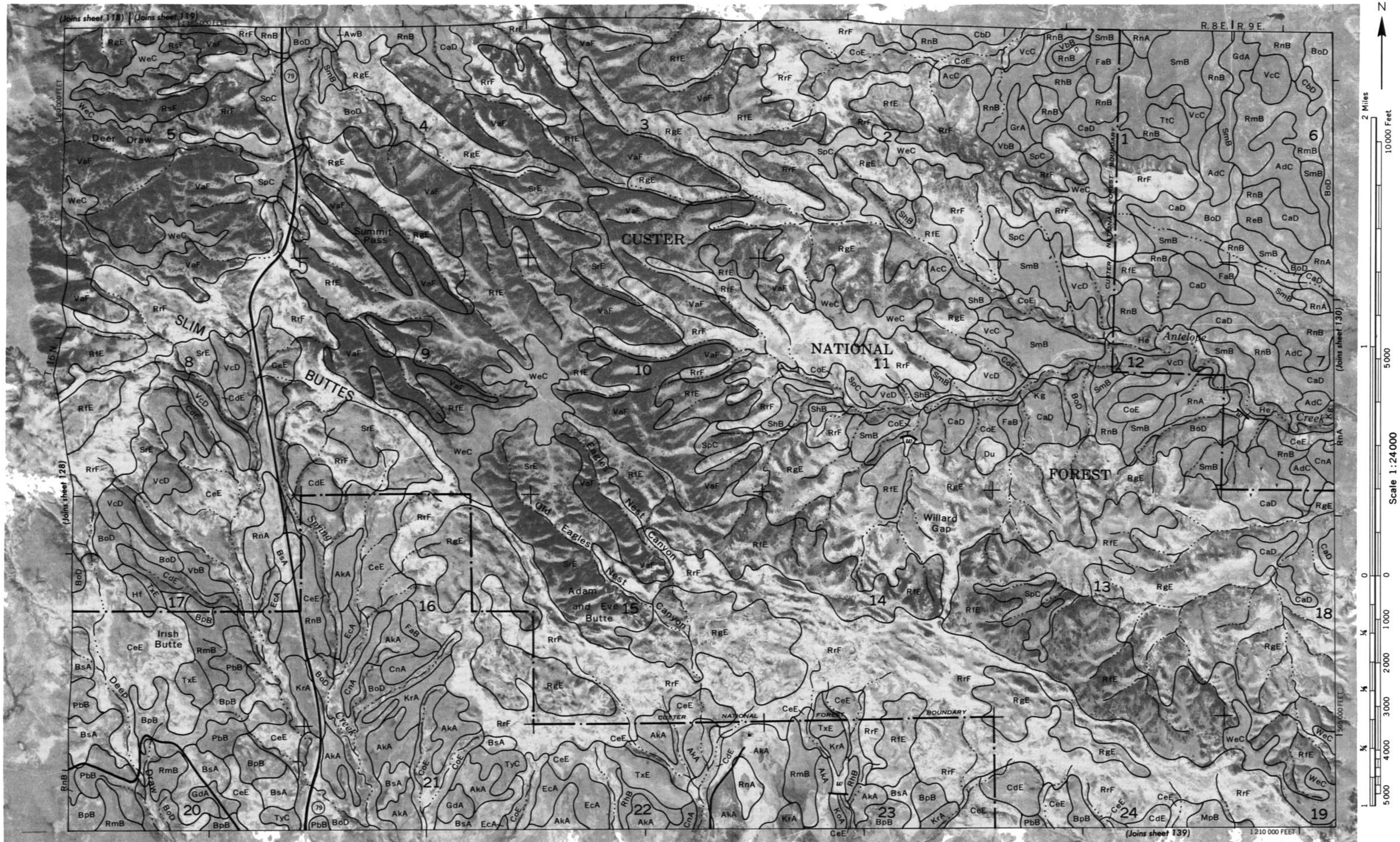


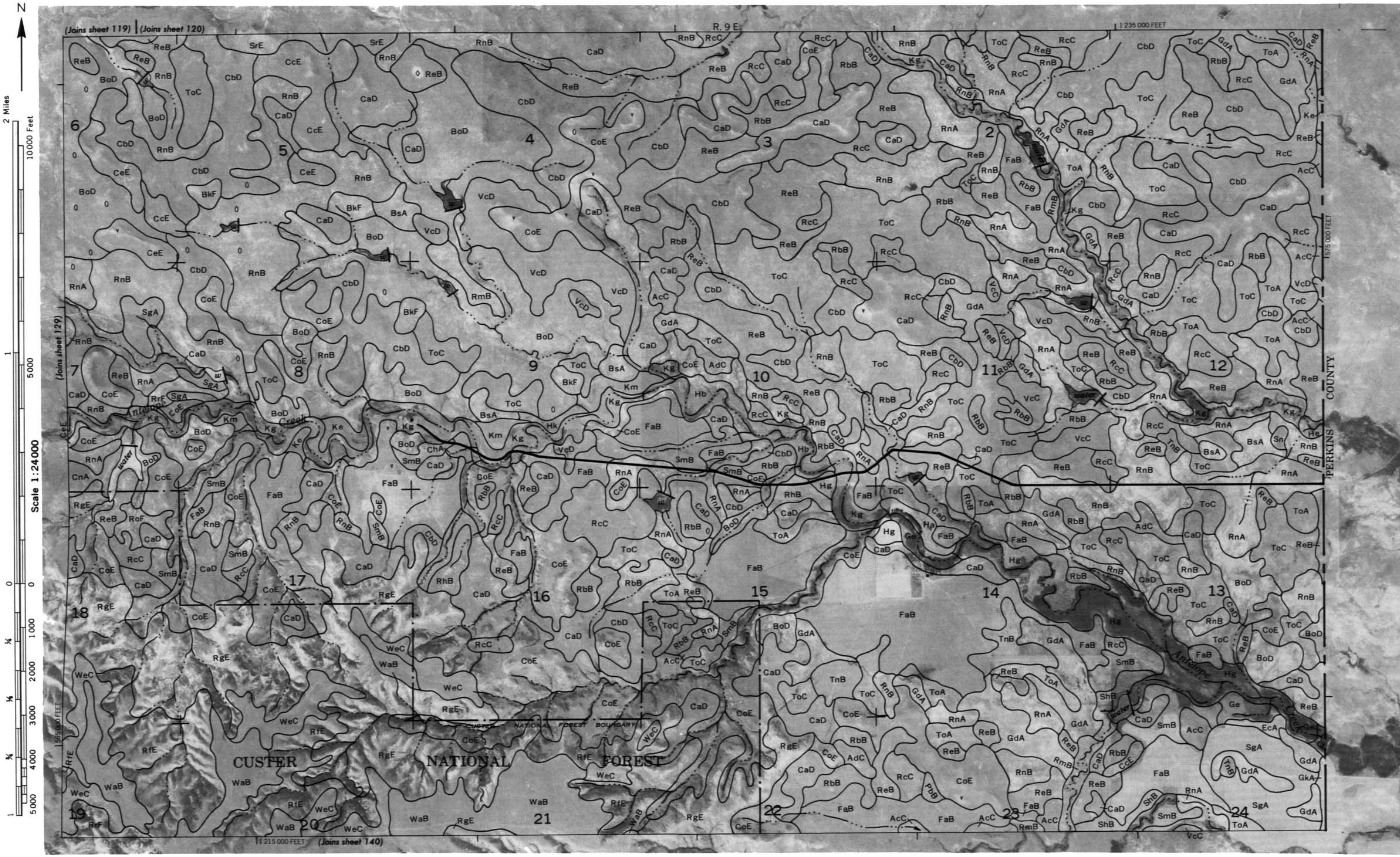
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 128

HARDING COUNTY, SOUTH DAKOTA NO. 129

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

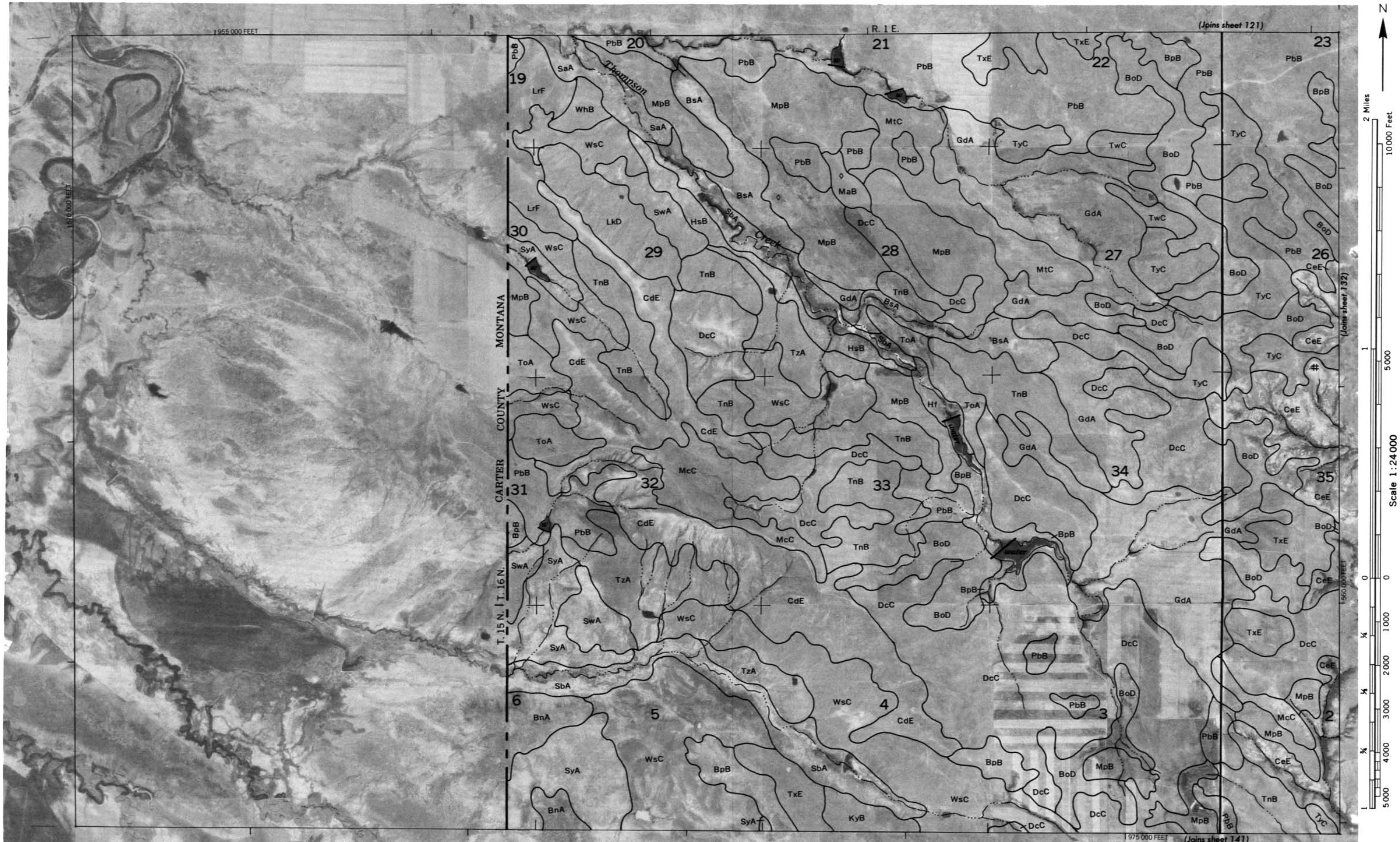


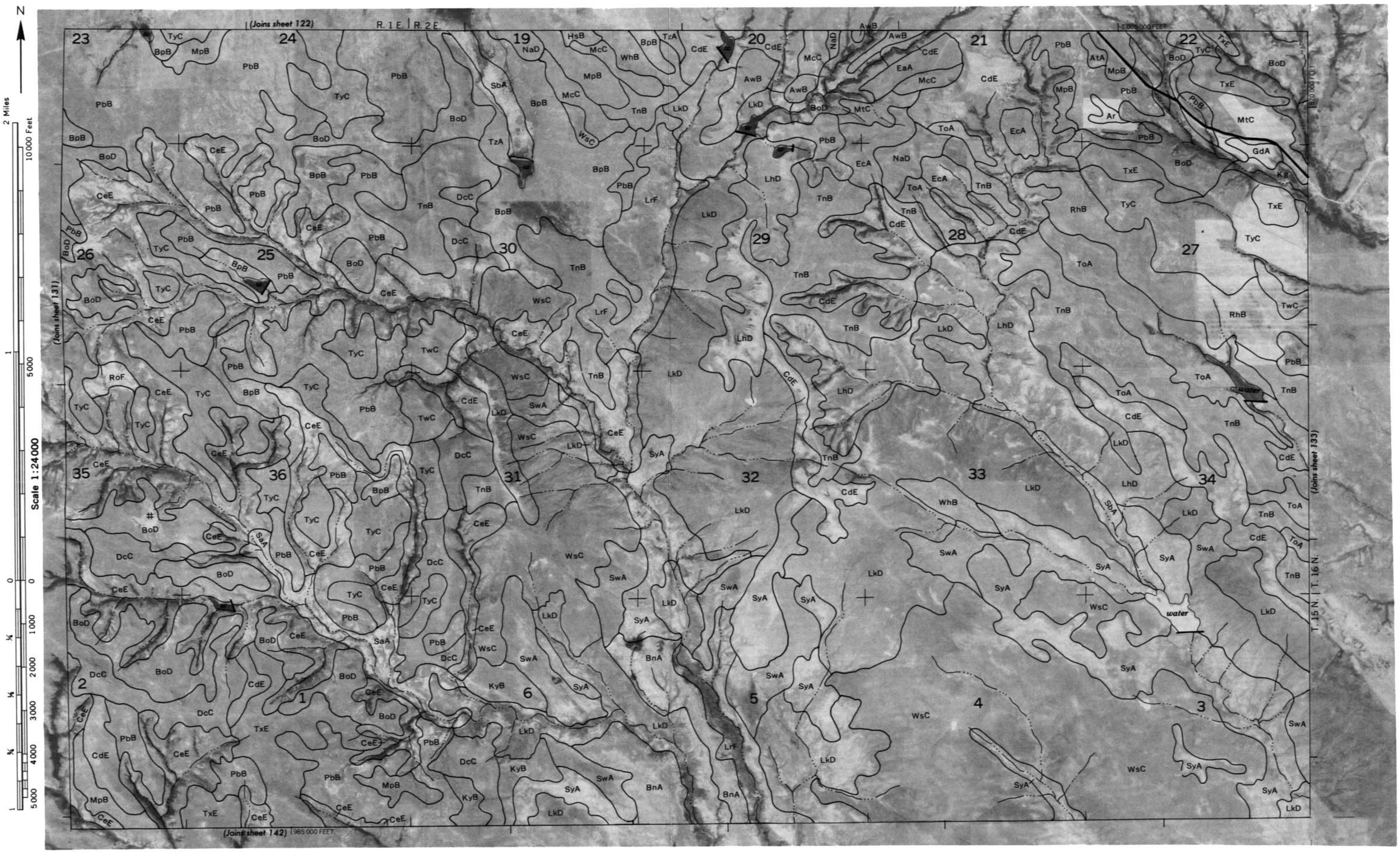


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 131

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



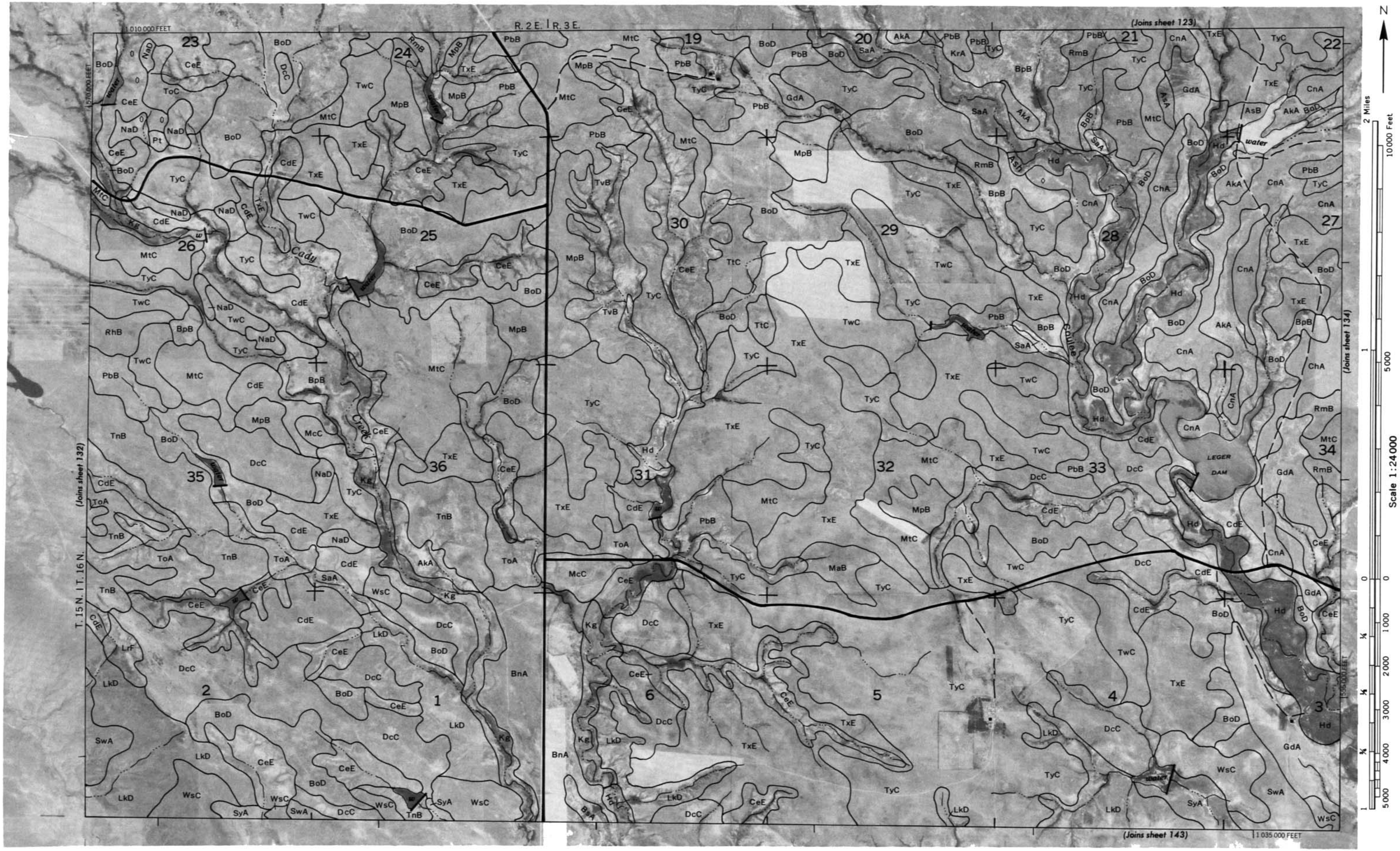


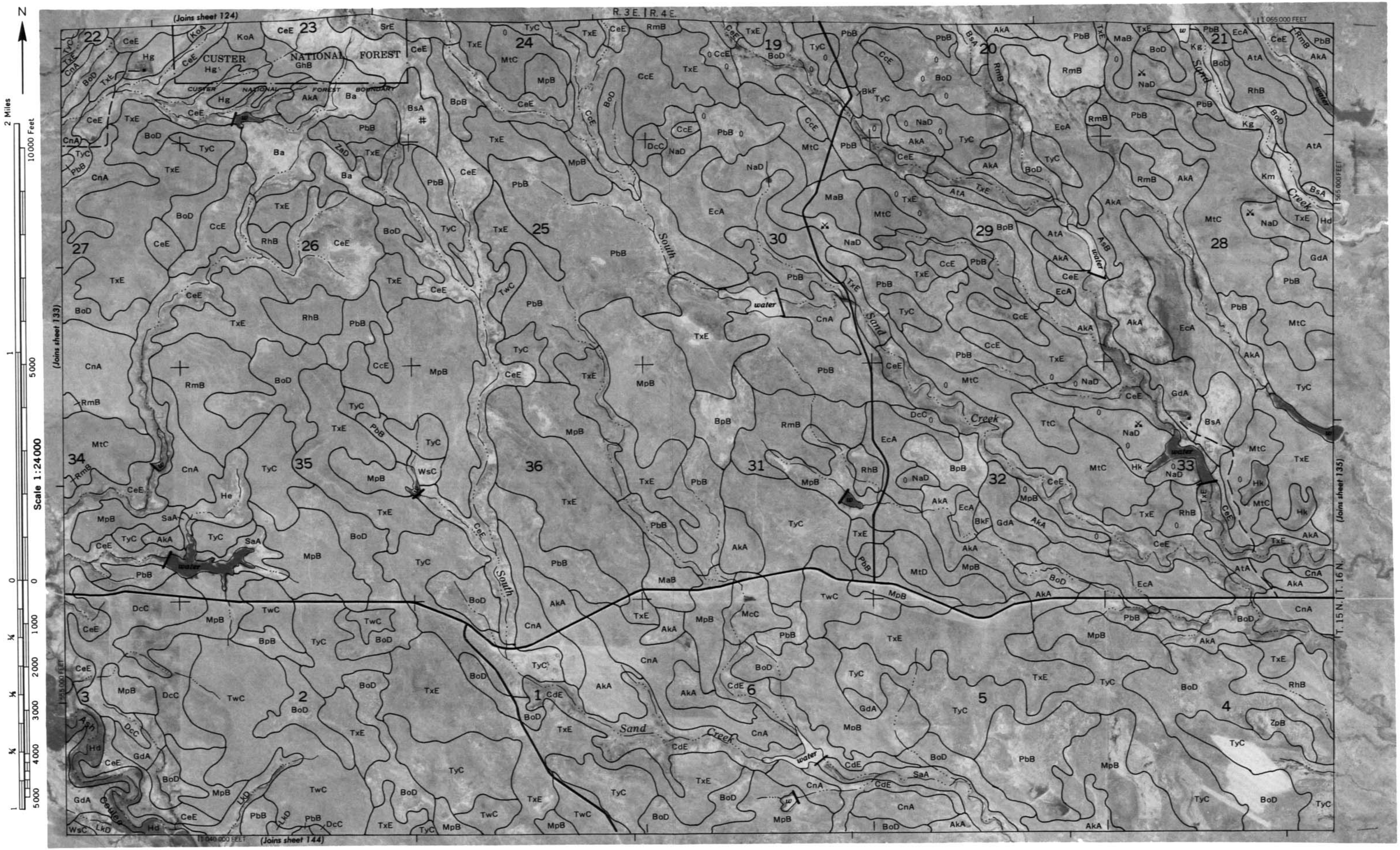
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 132

HARDING COUNTY, SOUTH DAKOTA NO. 133

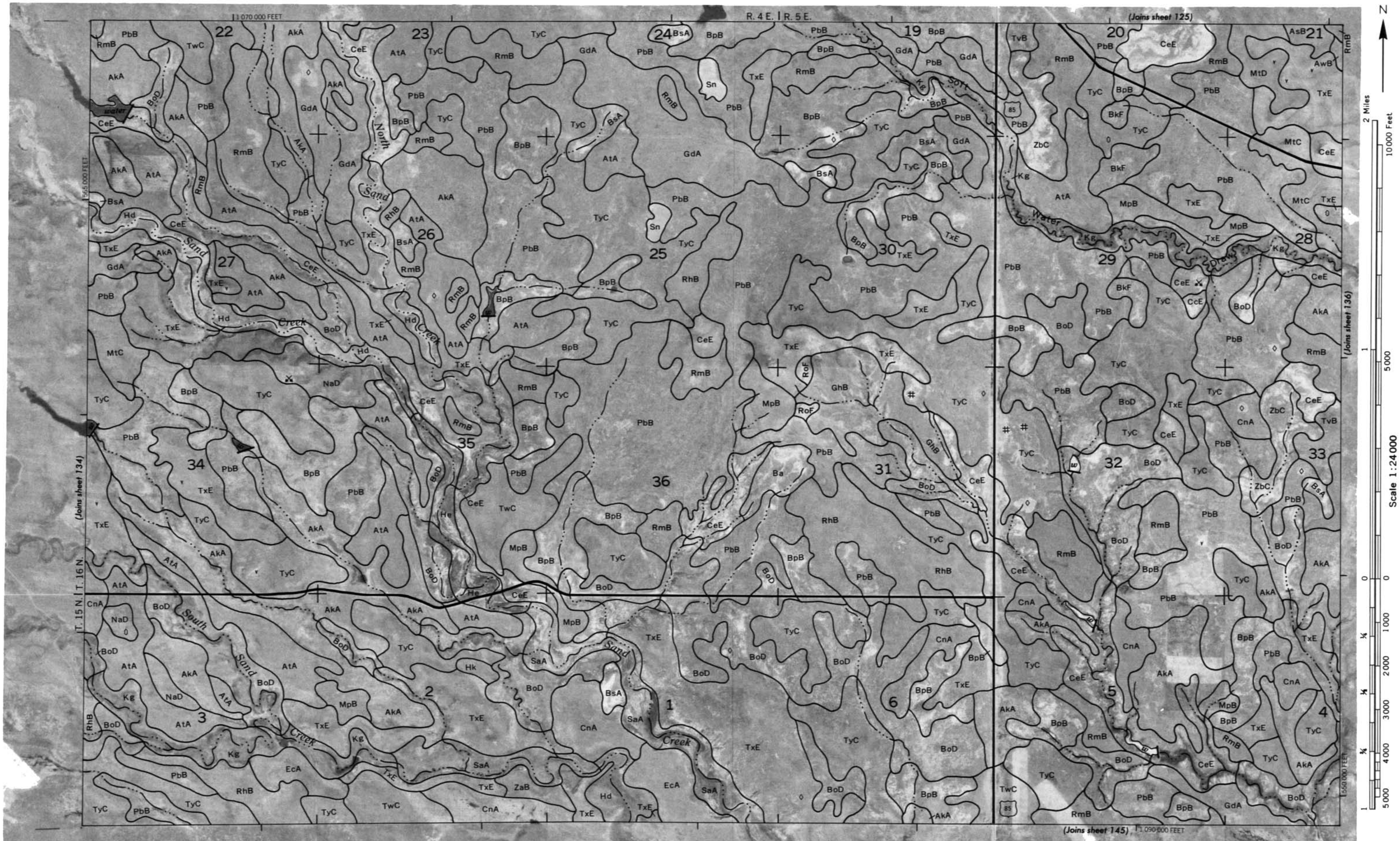
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





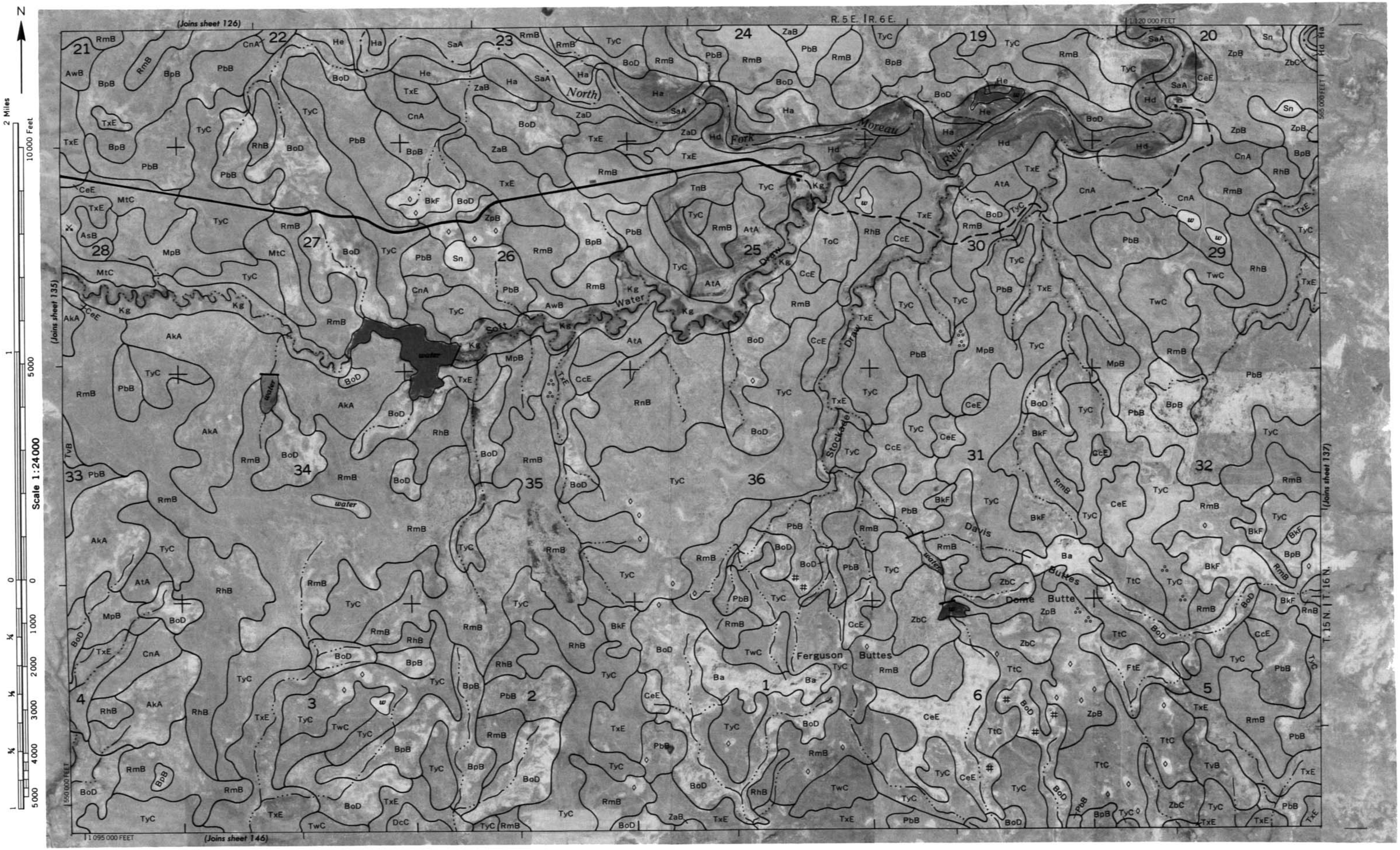
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

135



HARDING COUNTY, SOUTH DAKOTA NO. 135

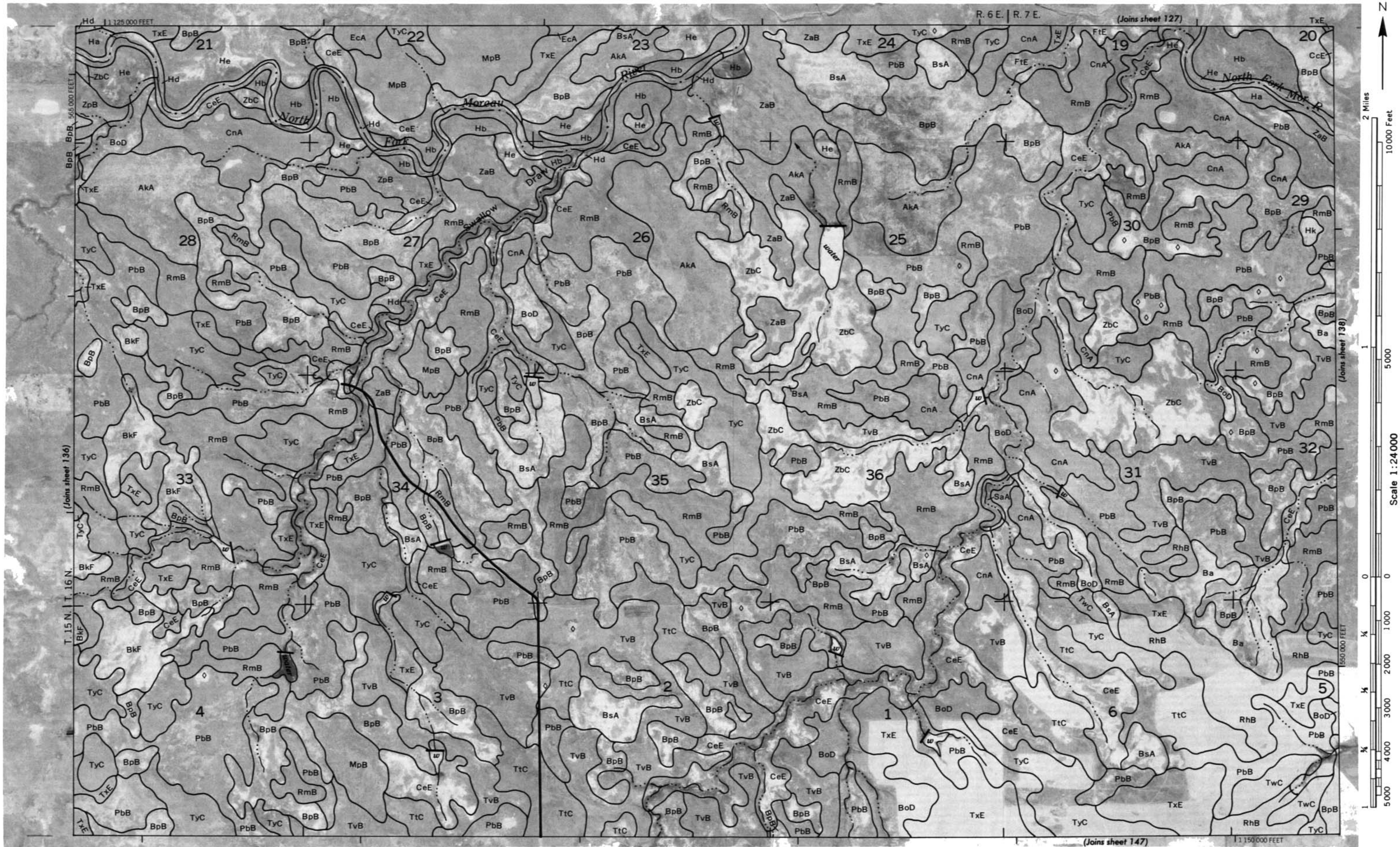
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

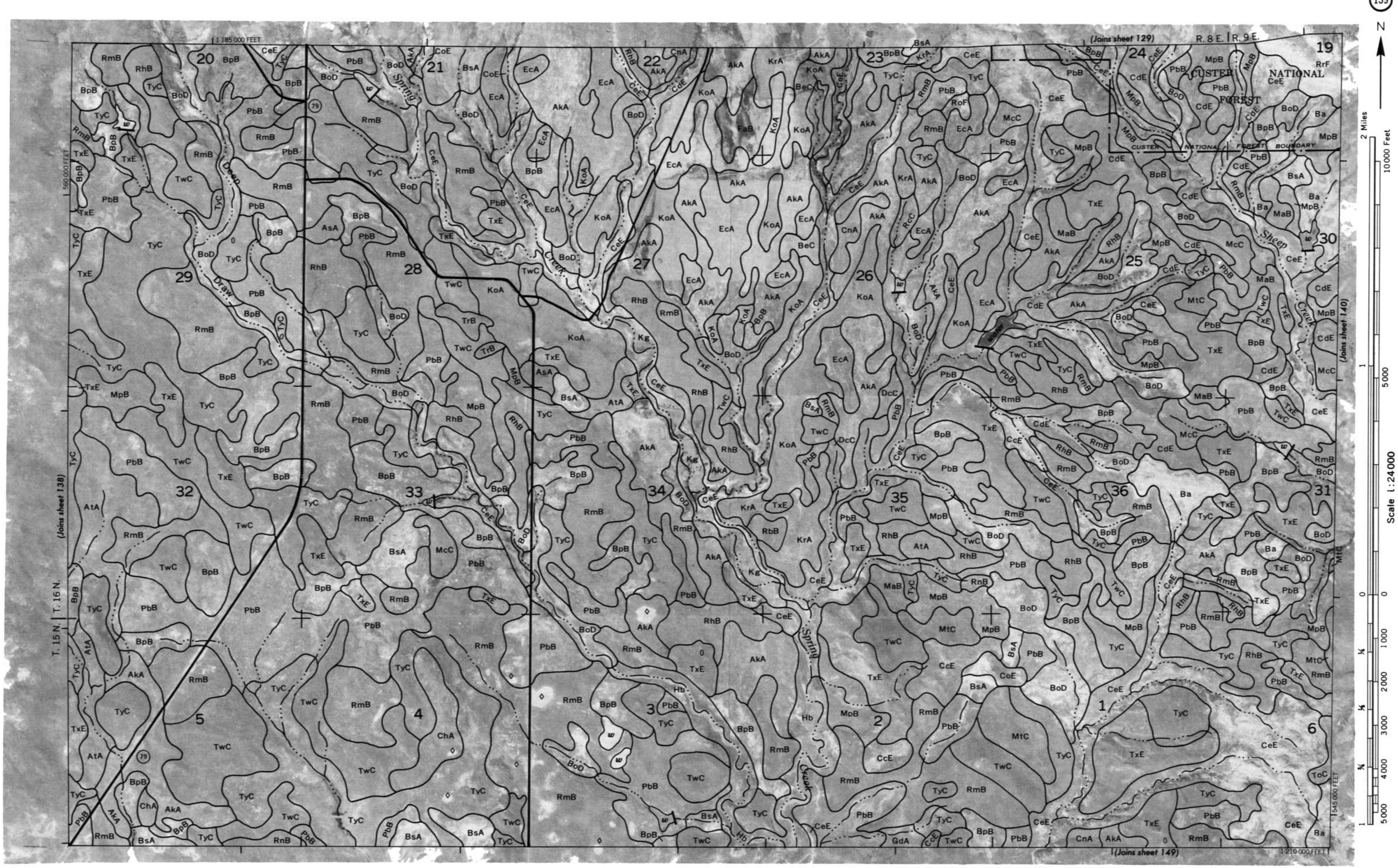
HARDING COUNTY, SOUTH DAKOTA NO. 137

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

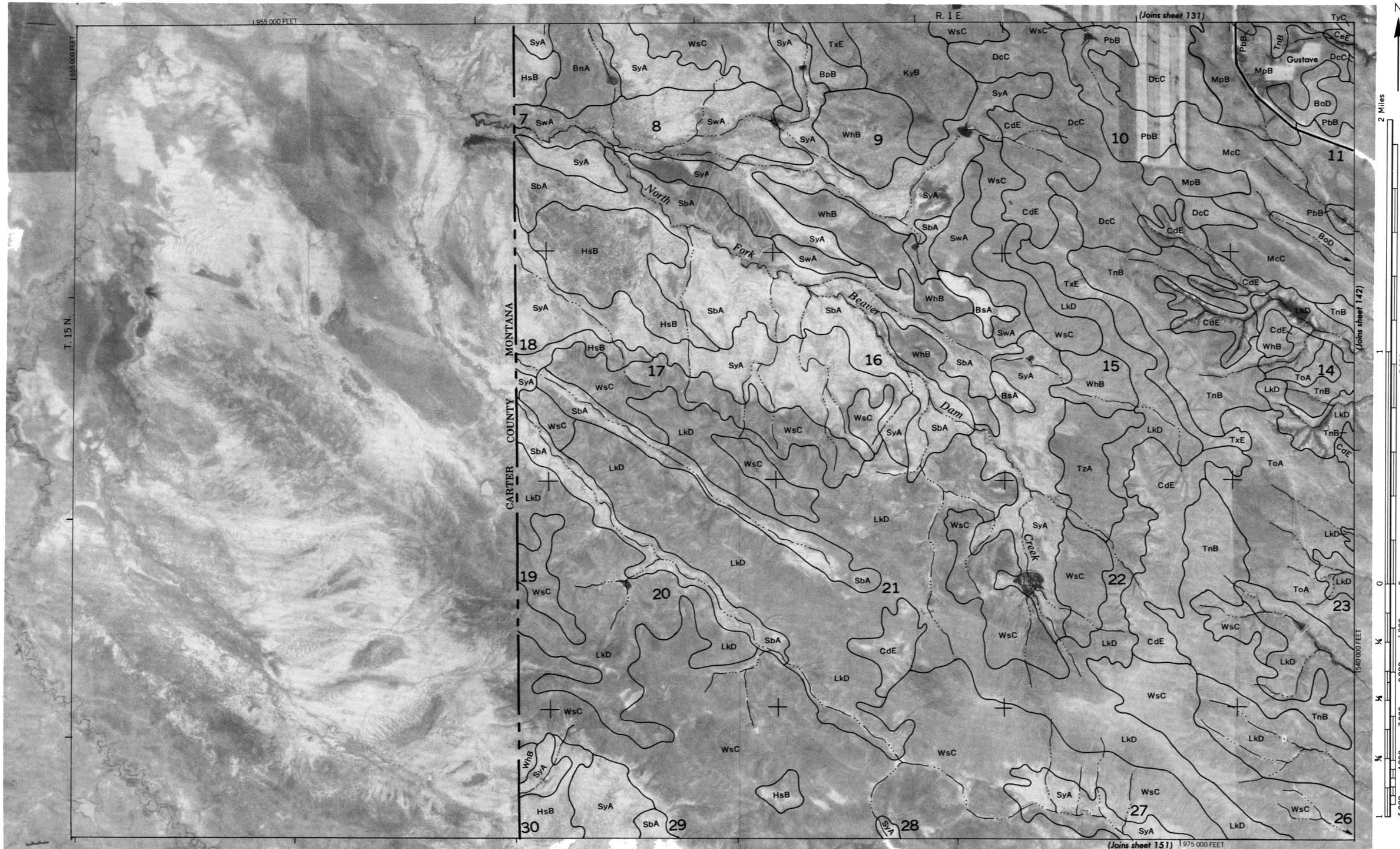


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 138


139
N
(Joins sheet 129)
R. 8 E. | R. 9 E.
CUSTER NATIONAL FOREST
CUSTER NATIONAL FOREST BOUNDARY
(Joins sheet 140)
(Joins sheet 149)
(Joins sheet 138)
T. 16 N.
T. 15 N.
1 185 000 FEET
1 210 000 FEET
560 000 FEET
545 000 FEET
Deep Draw
Spring Creek
Sheep Creek
Water
79
19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
1 2 3 4 5 6
Scale 1:24 000
2 Miles
1
0
10 000 Feet
5000
0
1 Kilometer
¾
½
¼
0
5000
4000
3000
2000
1000
0
5000

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

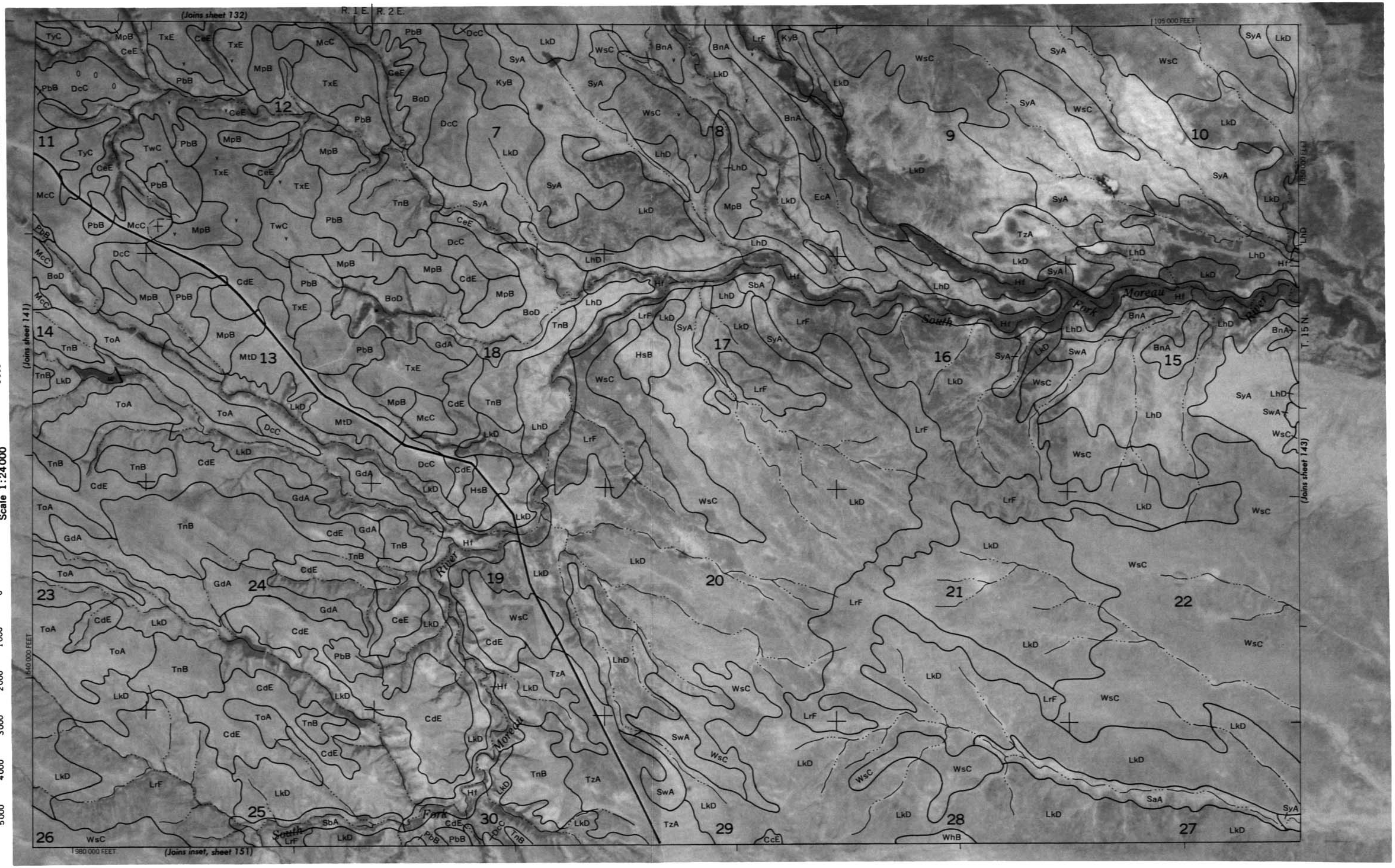


This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

142

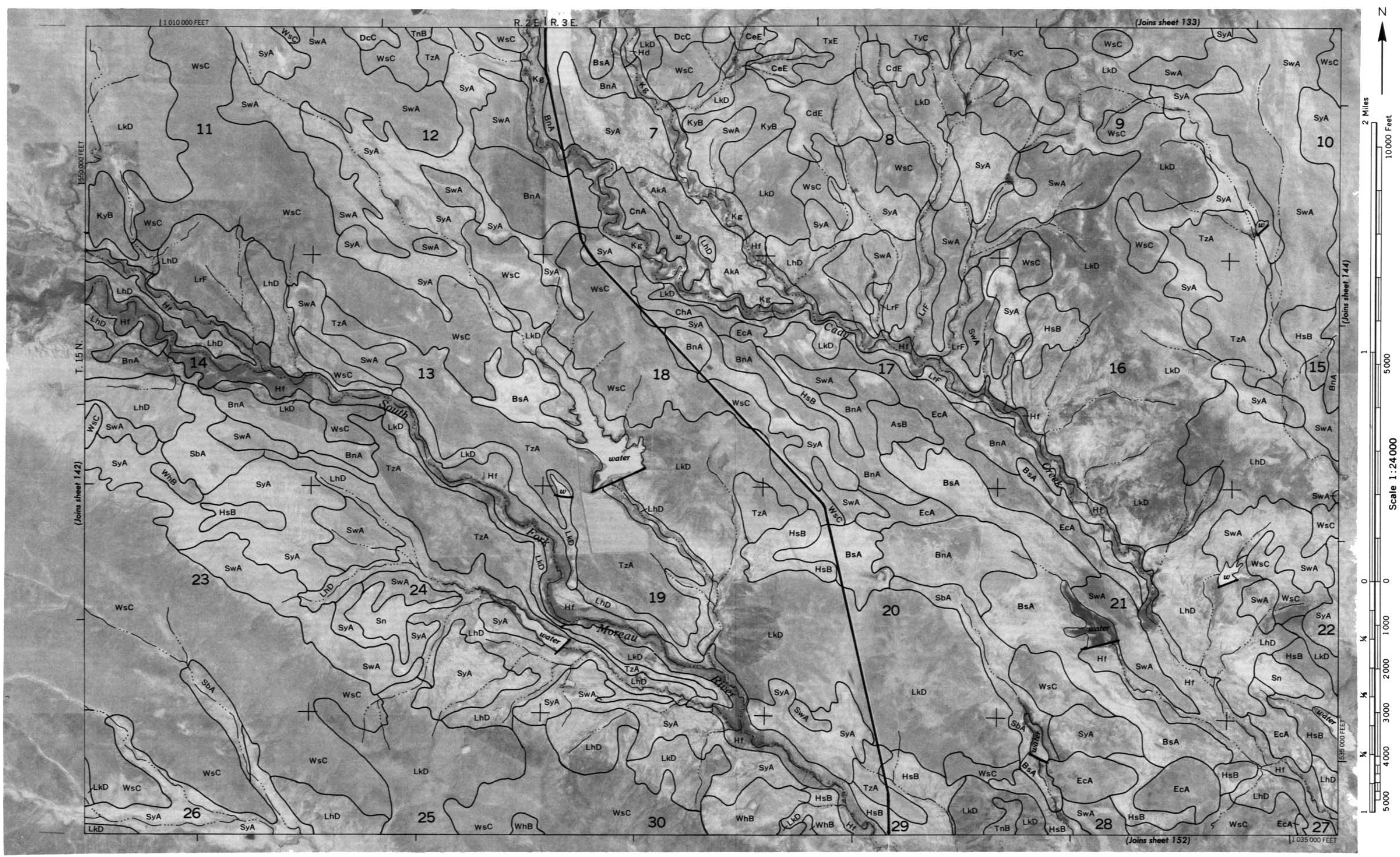
N

2 Miles
10 000 Feet
Scale 1:24 000



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 142



HARDING COUNTY, SOUTH DAKOTA NO. 143

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

2 Miles

10 000 Feet

1

5 000

Scale 1:24 000

0 0

1000

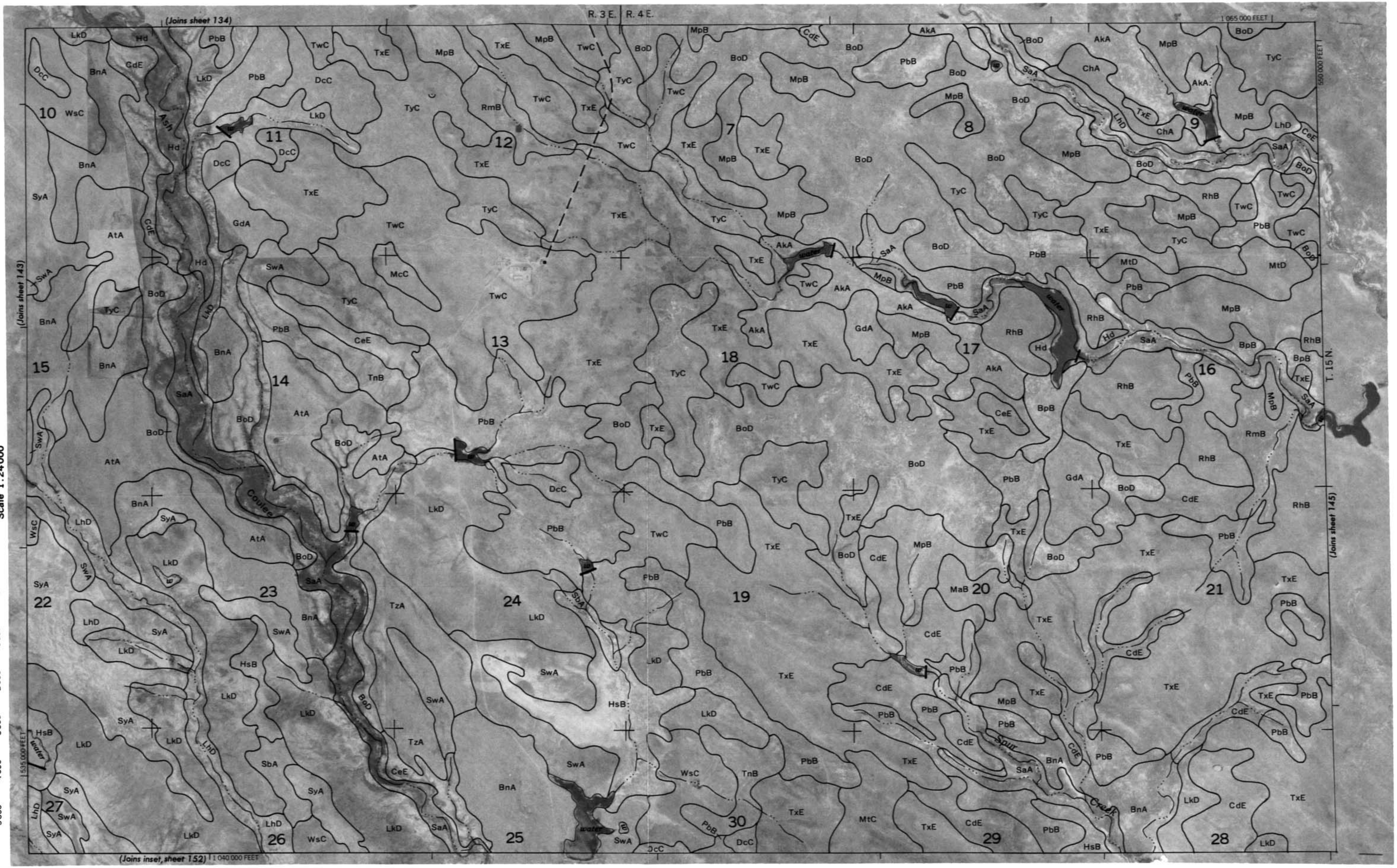
2000

3000

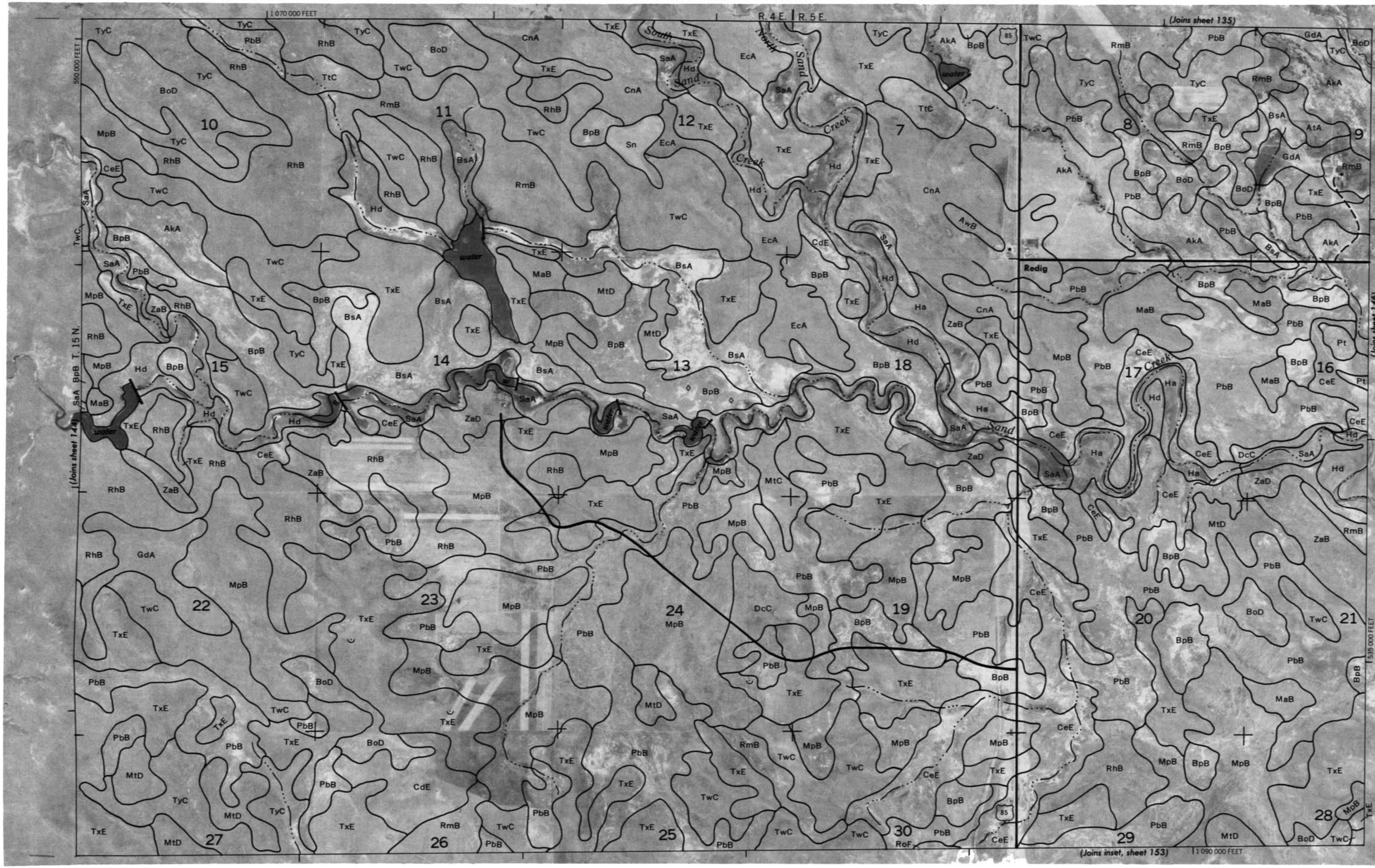
4000

5000

1



This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N

Scale 1:24000

2 Miles

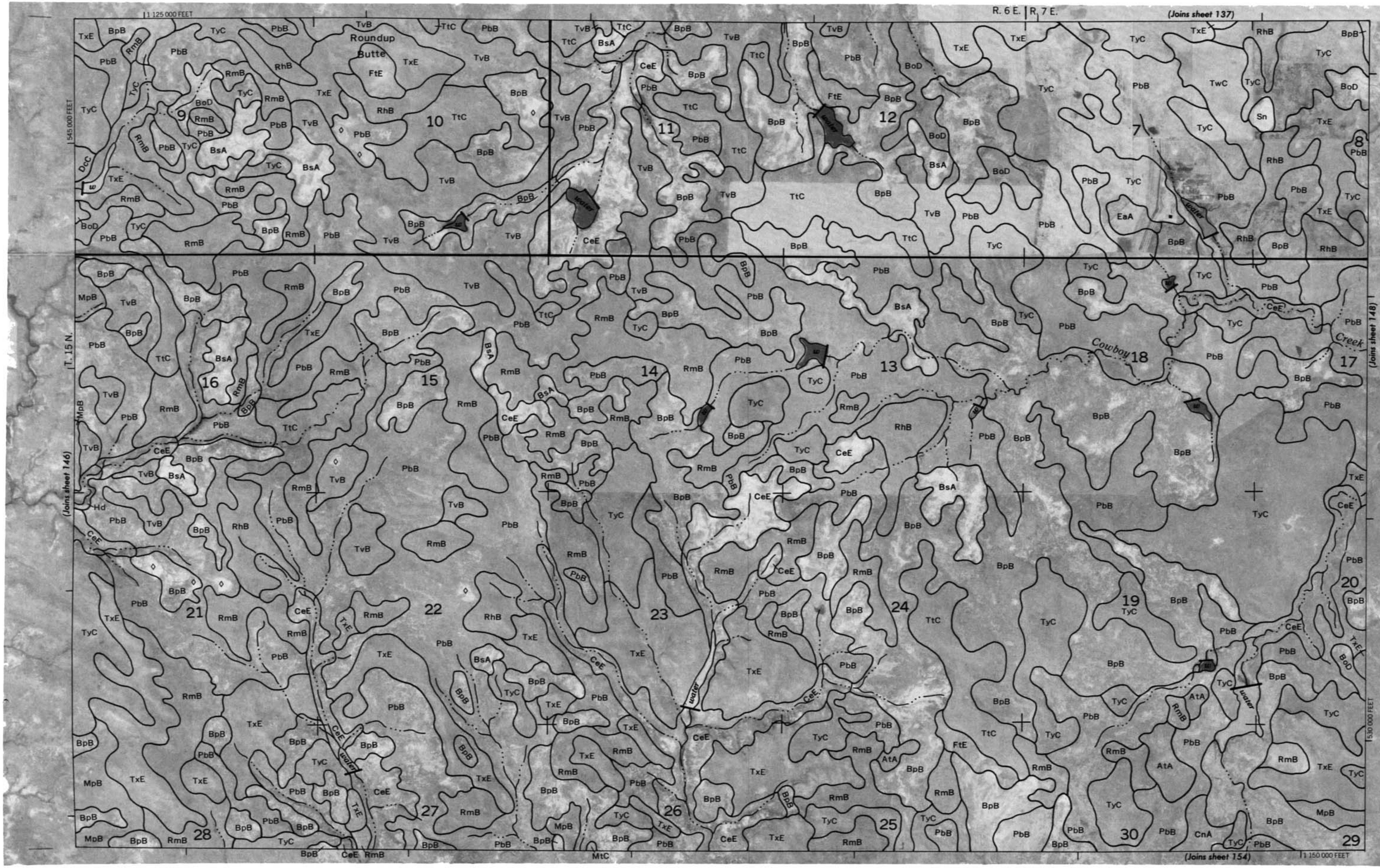
10 000 Feet

HARDING COUNTY, SOUTH DAKOTA NO. 145

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

147



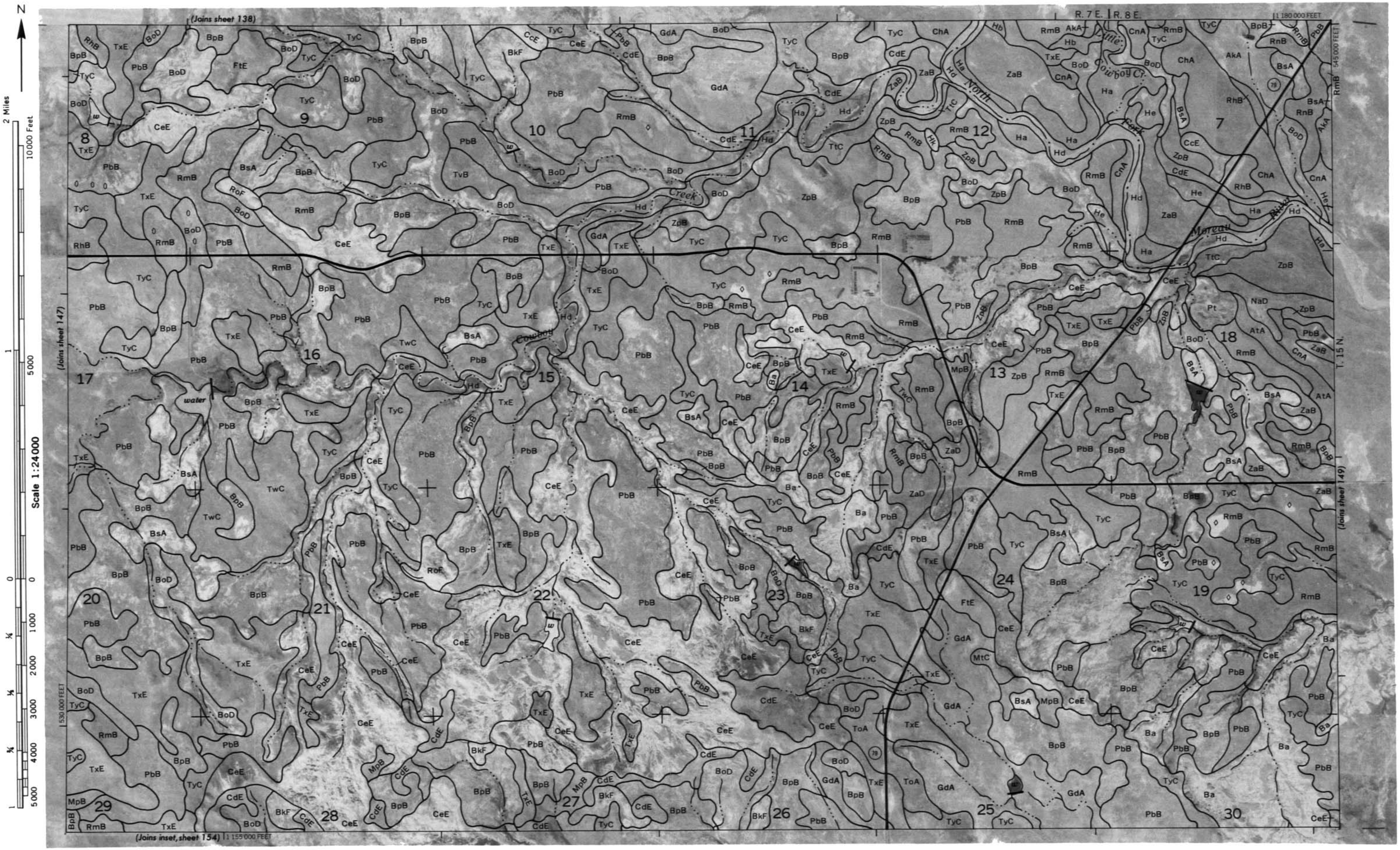
N

Scale 1:24000

2 Miles
10 000 Feet

HARDING COUNTY, SOUTH DAKOTA NO. 147

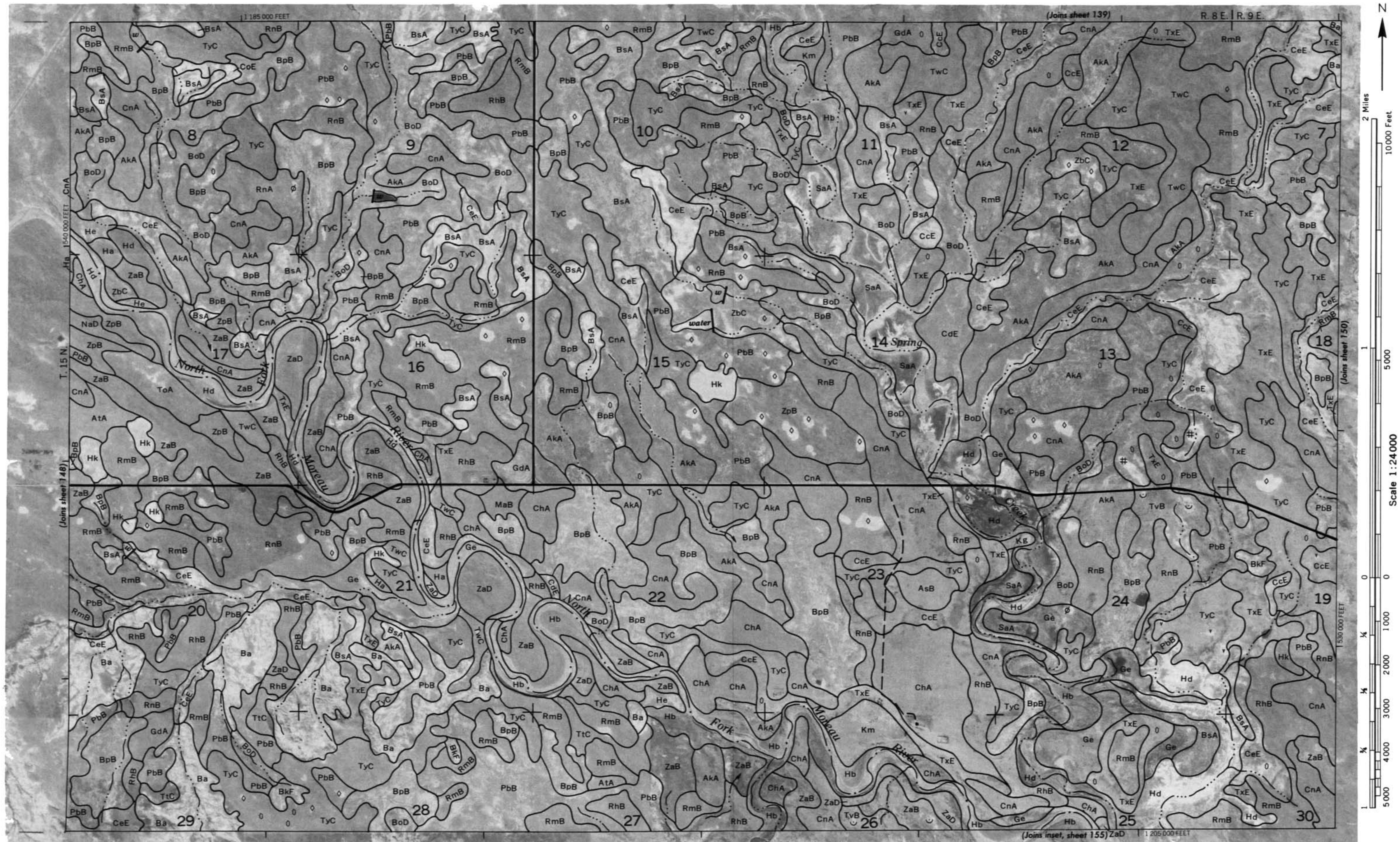
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



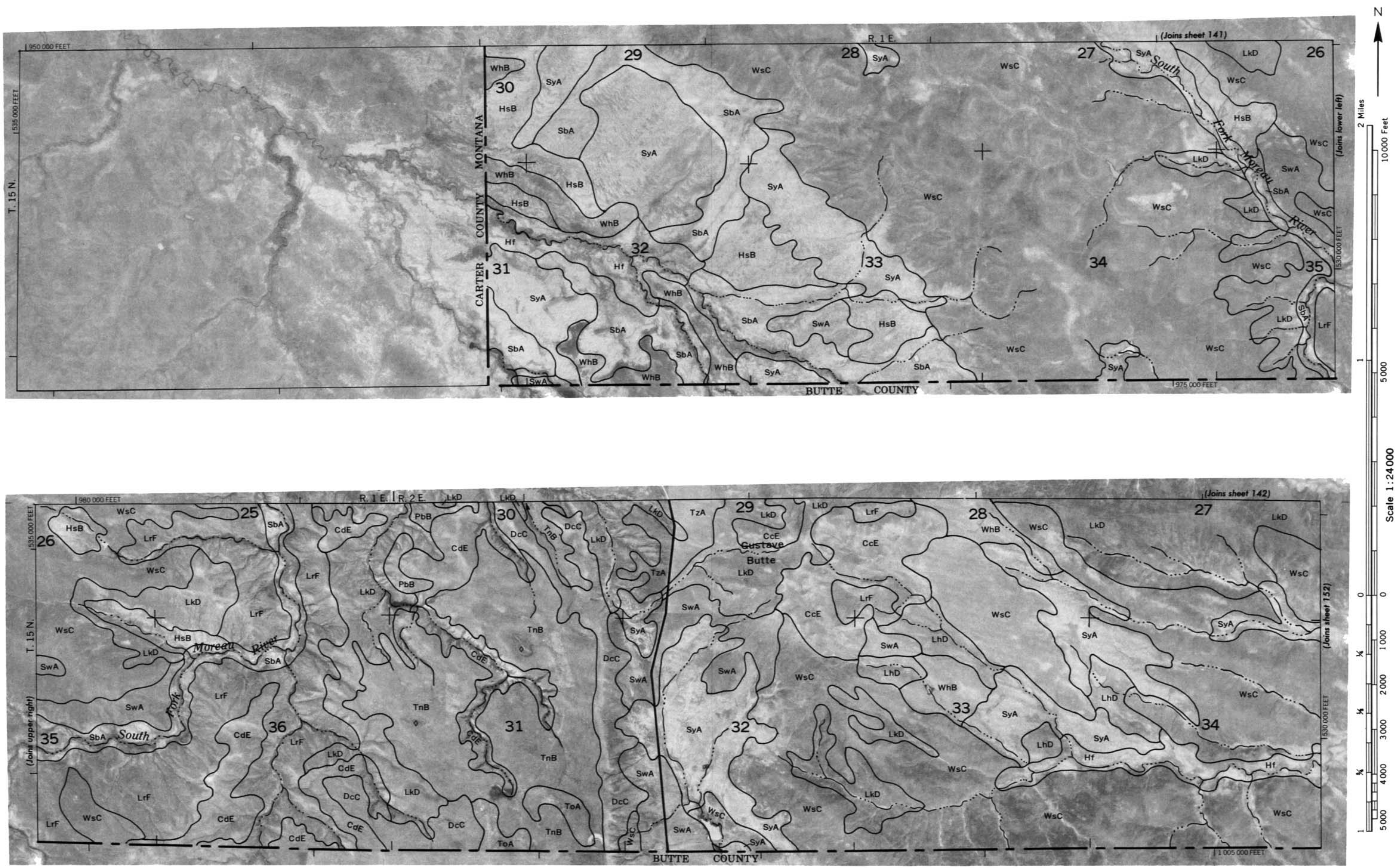
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 149

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

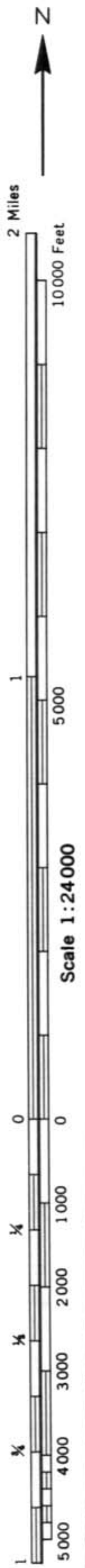


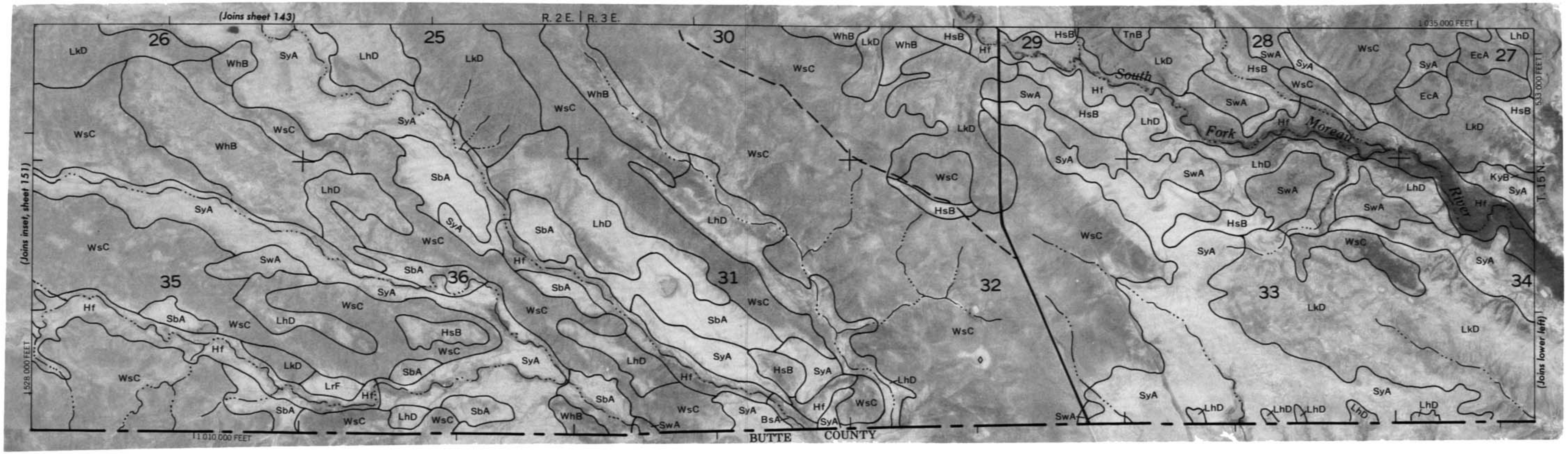
This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

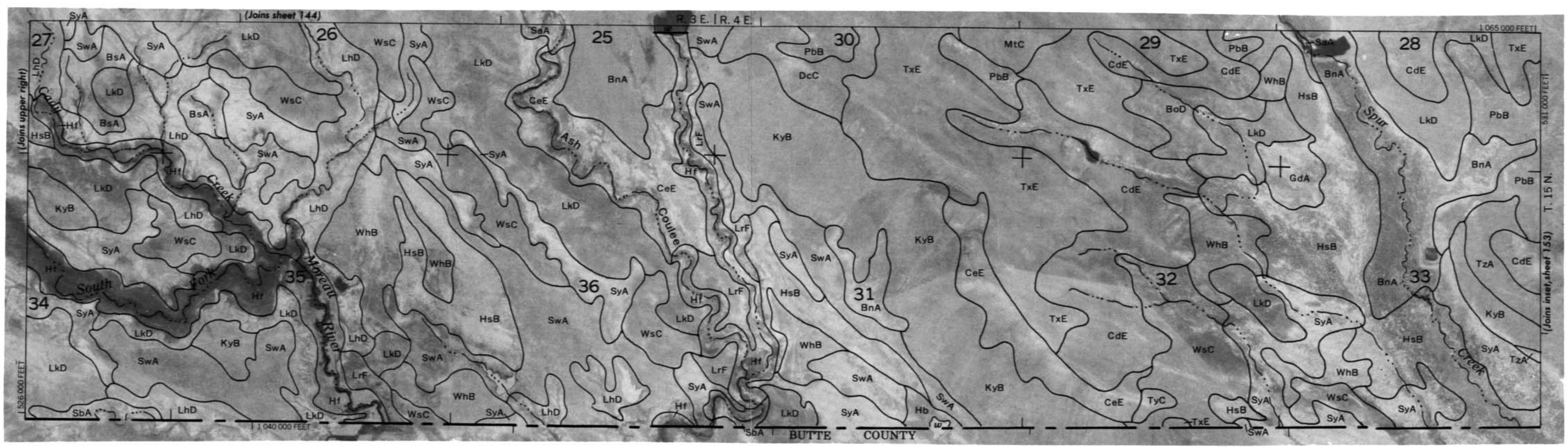


HARDING COUNTY, SOUTH DAKOTA NO. 151

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

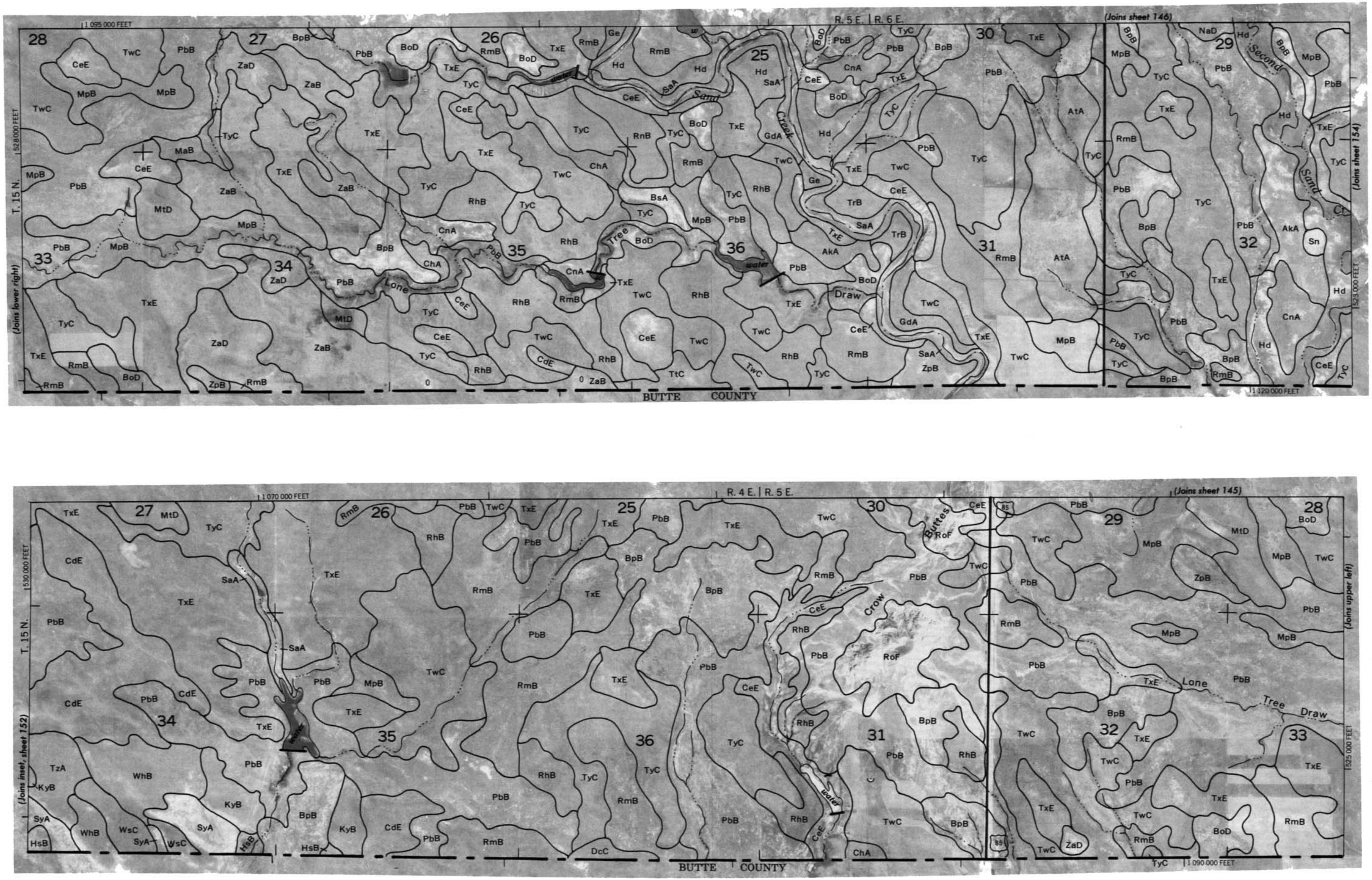






This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HARDING COUNTY, SOUTH DAKOTA NO. 152



N

Scale 1:24 000

2 Miles | 1 | 0

10000 Feet | 5000 | 0

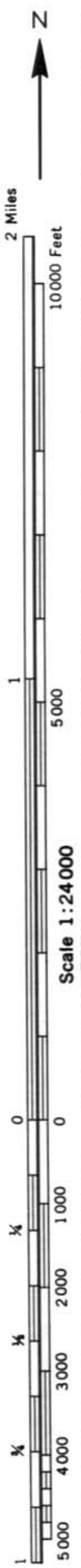
1 | ¾ | ½ | ¼ | 0

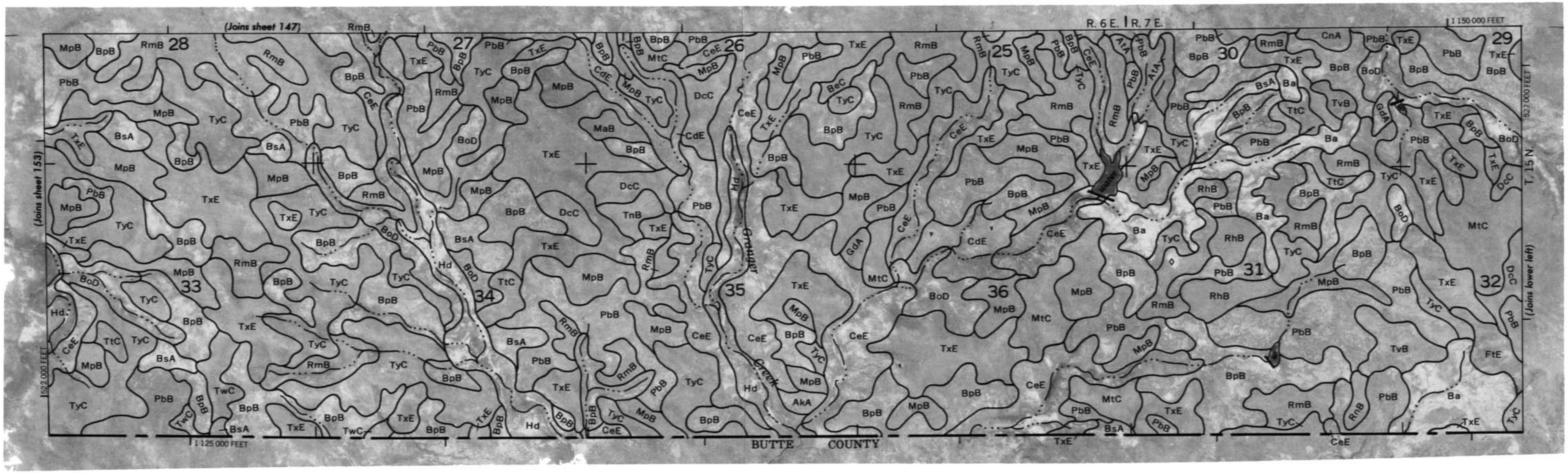
5000 | 4000 | 3000 | 2000 | 1000 | 0

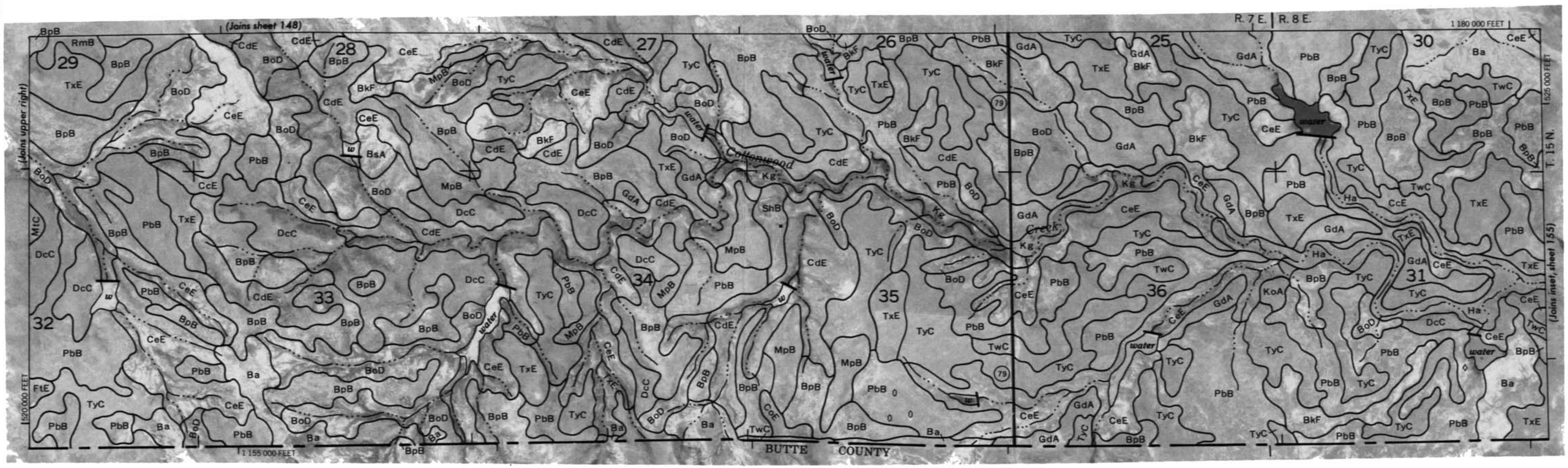
HARDING COUNTY, SOUTH DAKOTA NO. 153

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

154

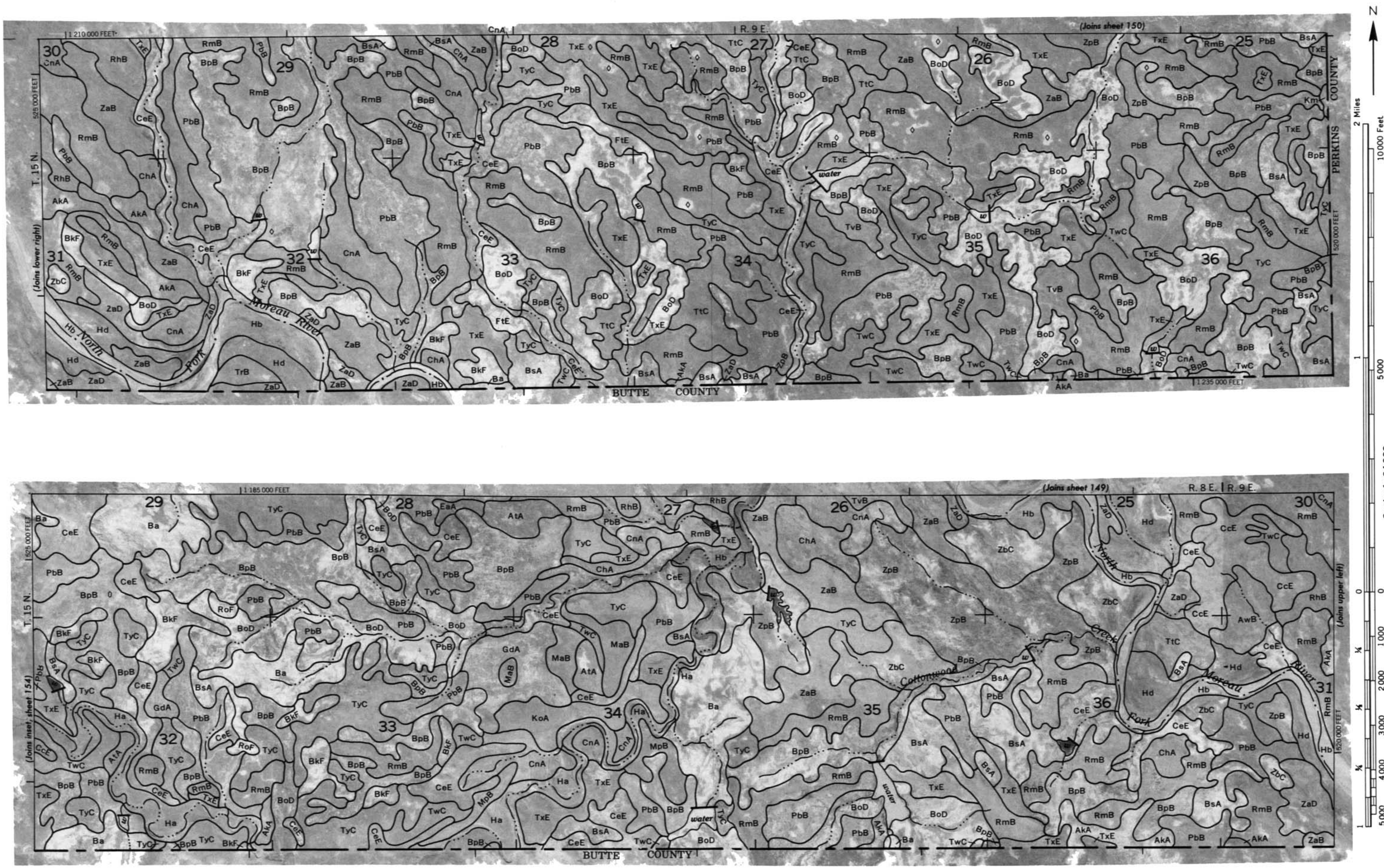






This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

155



HARDING COUNTY, SOUTH DAKOTA NO. 155

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.